SSP3021 - Master Thesis (15 ECTS)

# Involving Smallholder Farmers in Decarbonisation Strategy of the Agri-Food Industry:

# **A Case Study of Unilever's Decarbonisation Strategy for Palm Oil Production in Indonesia**


Student: **Eloise Jammes (i6399056)**

Supervisor: **Dr. Ron Cörvers**

2nd reader**: Sidi Amar**



Submission date: July 24, 2025

Word count: 14,646




Maastricht Sustainability Institute / Maastricht University

## Abstract

To meet the objectives set by the Paris agreement and upcoming EU regulation, the decarbonisation of a commodity's value chain requires efforts from all actors involved in the upstream activities, such as the smallholder, to successfully reduce GHG emissions in the long term.

In this context, this thesis investigates what decarbonisation strategy global agri-food companies are implementing to reduce GHG emissions in their commodity value chain, and if smallholder farmers are involved in these efforts. This study focuses on the decarbonisation of the palm oil value chain by looking at a single case study on the decarbonisation strategy implemented by Unilever and Indonesian smallholder farmers' current practices to reduce their palm oil farming-related GHG emissions. Finally, the study examines the synergies and trade-offs between the company's and the smallholder practices, and see if/how the smallholders are supported in their farming-related emissions reduction required by the company.

To uncover Unilever's strategies and Indonesian palm oil farmers, a qualitative approach was used and interviews and a document analysis were conducted.

The results show that Unilever's decarbonisation strategy aligns with findings from the literature while adding additional actions to meet their commitments. On the farmers' side, "climate-friendly" practices implemented by Indonesian smallholders align with practices identified in the literature. The results also provide insights into shared and different perspectives regarding practices in the palm oil sector. Finally, the results reveal various new potential palm oil farming practices with high potential for mutual benefit for farmers and Unilever.

Overall, this study demonstrates that Indonesian smallholder farmers are already implementing several climate-friendly practices that align with Unilever's decarbonisation strategy. However, the success of these practices also depends heavily on long-term support, market incentives, and investment in tools and partnerships. Recommendations for the palm oil sector include searching for standardisation of all the many "good practices" and certifications present in the sector, and further testing the framework on other companies and regions to identify similarities and differences, and understand how strategy and practices are adapted or replicated across regions.

## Table of Contents

## List of Figures



## List of Tables

## List of Abbreviations

| | |
|---|---|
| AFOLU | Agriculture, Forestry, and Other Land Uses |
| CH4 | Methane |
| CO2 | Carbon dioxide |
| COP | Conference Of Parties |
| CPO | Crude Palm Oil |
| CSA | Climate Smart Agriculture |
| CSDDD | Corporate Sustainability Due Diligence Directive |
| CSRD | Corporate Sustainability Reporting Directive |
| DCA | Dutch Consumer Association |
| EU | European Union |
| EUDR | European Union Deforestation Regulation |
| FFB | Fresh Fruit Bunches |
| FLAG | Forest, Land, and Agriculture |
| GAPs | Good Agriculture Practices |
| GHG | Greenhouse gas |
| IPCC | Intergovernmental Panel on Climate Change |
| ISH | Independent Smallholder |
| ISPO | Indonesian Sustainable Palm Oil |
| LCA | Life Cycle Assessment |
| LULUCF | Land Use Land Use Change Forestry |
| NDPE | No Deforestation, No Peat and No Exploitation |
| NDC | No deforestation, No Conversion |
| NGO | Non-Governmental Organisation |
| PKO | Palm Kernel Oil |
| RPO | Refined Palm Oil |
| RQ | Research Question |
| RSPO | Roundtable Sustainable Palm Oil |
| RSPO-IP | Roundtable Sustainable Palm Oil Identity Preserved |
| RSPO-ISH | Roundtable Sustainable Palm Oil Independent Smallholder |
| RSPO-MB | Roundtable Sustainable Palm Oil Mass Balance |
| RSPO SG | Roundtable Sustainable Palm Oil Segregated |
| SAPs | Sustainable Agriculture Practices |
| SBTi | Science Based Targets initiative |
| SH | Smallholder |

# 1. Introduction

## 1.1. Context

Human activities are contributing to the increase of global greenhouse gases (GHG), marking a new era, the Anthropocene Crutzen (2002). This era also recognises the responsibility of anthropogenic GHG emissions for the acceleration of global warming and for severely affecting the stability of the climate (Crutzen, 2002; IPCC, 2022).

Globally, the agrifood system, involving production, transport, processing, retail and consumption among others, is responsible for approximately 21-37% of total GHG emissions (Mbow et al., 2019). The majority of these emissions come from the Agriculture sector, crops and livestock production, and the Land Use, Land-Use Change, and Forestry (LULUCF) sector, also known as the AFOLU sector (Mbow et al., 2019). Within the AFOLU sector, it is estimated that about half of these emissions in the form of carbon dioxide (CO2) are related to LULUCF, mainly due to deforestation, biomass fires and peatland degradation (FAO, 2024; IPCC, 2022). Often linked to land clearance, it has been proven to be highly linked with the agricultural expansion widely driven by international demand, as in the case of commodities such as palm oil, cocoa, coffee, and wheat (FAO, 2024; Pendrill et al., 2019).

Globally, the livelihood of many smallholder farmers (hereafter referred to as smallholders or small farmers) depends on the cultivation of commodities in which they also hold a significant share of the global production. Mainly located in the “Global South”, smallholders produce, for example, around 30% of the global palm oil (Saadun et al., 2018), about 70% of cocoa (Scudder et al., 2022) and over 70% of coffee (Jawo et al., 2023). Given their socio-economic conditions, smallholders tend to produce crops with relatively high GHG intensity compared to other producers (Cohn et al., 2017). Therefore, they are likely to play an important role in GHG emissions and mitigation efforts (Cohn et al., 2017).

In 2015, during the UN Climate Change Conference (COP21) in Paris, 196 Parties signed the Paris Agreement to limit global warming (United Nations, n.d.). This agreement specifies that efforts should be made to limit the global average temperature increase to 1,5°C above pre-industrial time and overall, limit its increase to “well below 2°C” (United Nations, n.d.). In

response to the situation, the European Union (EU) and its Member States committed to becoming the first climate-neutral continent by 2050 under the European Green Deal (European Commission[5], n.d.). Therefore, by 2050, the same amount of GHG emissions emitted in the EU countries should also be removed from the atmosphere (European Commission[3], n.d.). Additionally, to make companies responsible for their social and environmental impact across their value chain, inside and outside Europe, the EU introduced new laws and regulations. In 2023, the EU Regulation on Deforestation-free Products (EUDR) entered into force, which stipulates that companies in Europe may only import, export, or produce goods and products that do not cause deforestation or degrade forests. The EUDR applies to seven global commodities entering the EU, such as cattle, cocoa, coffee, oil palm, rubber, soy, and wood (European Commission[4], n.d.). More recently, in 2024, the EU Corporate Sustainability Due Diligence Directive (CSDDD) was declared, which requires large companies to address their negative impact on human rights and the environment in their operation and across their value chain (European Commission[1], n.d.). Since 2025, large companies with more than 1,000 employees are obliged to report their company's impact on the people and the environment under the Corporate Sustainability Reporting Directive (CSRD) (European Commission[2], n.d.).

Under the pressure of new regulations, consumers and non-governmental organisations (NGOs), agri-food companies, key players in the agrifood system, have been leading the “low-carbon” transition and are implementing a strategy to decarbonise their value chain (Acampora et al., 2023).

Despite being a significant contributor to climate change, the AFOLU sector is also considered to be one of the most vulnerable, while presenting many opportunities to mitigate climate change through emissions reduction and carbon storage (Fleming et al., 2019; IPCC, 2022). Both agri-food companies and smallholders are affected by climate change, particularly through declining production yields, which also pose a severe threat to the livelihoods of many. Given the vital role of smallholders in global commodity production, their inclusion and support in the decarbonisation strategy of agri-food companies are essential.

## 1.2. Problem statement

Under new EU regulations, agri-food companies operating in Europe must reduce emissions from their value chain, which includes all activities occurring along the value chain, from farmers to consumers. Under the framework designed by the GHG Protocol[1], emissions have been categorised into three scopes, the so-called 'Scope 1 and 2' representing emissions related to the company's direct activities and their energy usage, and the 'Scope 3' encompassing upstream and downstream activities' GHG emissions (Ranganathan et al., 2004). While it is seen as "easier and cheaper" p.XIX (Santos et al., 2022) to reduce the Scope 1 & 2 as it relates to activities under the company's direct control, the biggest challenge remains the reduction of the Scope 3 (Santos et al., 2022). Indeed, representing activities occurring outside a company's site and direct control, these activities are likely to be executed by multiple actors across the globe, which often accounts for the largest part of a company's emissions (Santos et al., 2022). For example, in 2024, Scope 3 emissions accounted for more than 95% of the total GHG emissions of Unilever, Nestlé and Mondelez International (Mondelez International, 2025; Nestlé, 2025; Unilever, 2025a).

To meet the objectives set by the Paris agreement and upcoming EU regulation, the decarbonisation of a commodity's value chain requires efforts from all actors involved in the upstream activities, such as the smallholder, to successfully reduce GHG emissions in the long term. In this context, this thesis aims to investigate what decarbonisation strategy global agri-food companies are implementing to reduce GHG emissions in their commodity value chain, and if smallholder farmers are involved in these efforts. Therefore, the study focuses on the decarbonisation of the palm oil value chain by looking at the decarbonisation strategy implemented by Unilever and Indonesian smallholder farmers' current practices to reduce their palm oil farming-related GHG emissions. Finally, the study wants to examine the synergies and trade-offs between the company's and the smallholder practices, and see if/how the

[1] The Greenhouse Gas (GHG) Protocol was developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) and provides a framework to measure and manage their GHG emissions. https://ghgprotocol.org/about-us

smallholders are supported in their farming-related emissions reduction required by the company.

## 1.3. Research aims and objectives

The objectives of this thesis are to understand the current decarbonisation efforts in the global palm oil value chain and to see how these include smallholders. It examines the decarbonisation strategy of a global agri-food company, Unilever, and practices implemented by Indonesian palm oil smallholder farmers to reduce their GHG emissions. By doing so, it aims to understand if/how the company's strategy and smallholders' actions present synergies and trade-offs, and if/how the smallholders are supported in their farming-related emissions reduction required by the company. To achieve this aim, the following objectives are central to this study:

- **Exploring what smallholder palm oil farmers are doing to decarbonise their farming practices**: As smallholders play an important role in the agriculture sector, being the third largest emitting sector, it is crucial to examine their implemented practices and support them, as they are a vulnerable population to climate change.
- **Uncovering what decarbonisation strategy companies are implementing to reduce GHG emissions in the palm oil value chain**: Agri-food companies play a key role in the decarbonisation of the palm oil industry, as they involve and affect multiple actors across the world.
- **Assessing if the company's strategy and smallholders' practices to decarbonise the palm oil production present synergies or/and trade-offs**: Evaluating "win-win" and "win-lose" between top-down strategies and bottom practices can help identify aligned (synergy) situations to maintain or/and amplify, and identify areas for improvements.
- **Assessing if the examined company's strategy and smallholders' farming practices correspond to scientific literature about the decarbonisation of the global agricultural value chain**: Comparing and contrasting the findings with scientific literature helps to identify knowledge consistency or differences, hence highlighting if current practices still align with the current theory, and identifying possible changes and/or new trends in the field.

## 1.4. Research questions

To achieve the aim and objectives of this thesis, the following research question is central to this study:

***What "climate-friendly" practices do smallholder farmers in Indonesia implement to decarbonise their palm oil-related farming activities, and what trade-offs and synergies exist between their practices and Unilever's strategy for decarbonising their palm oil value chain?***

To guide the research the following sub-questions are formulated:

*SQ-1: What strategy does Unilever have to decarbonise their palm oil value chain?*

*SQ-2: What actions do smallholder farmers in Indonesia implement to decarbonise their palm oil-related farming activities?*

## 1.5. Outline of remaining thesis

This introduction presented the general context of the research while exposing the role of involving palm oil smallholder farmers in decarbonising the value chain of agri-food companies. Chapter 2 examines the palm oil's sustainability challenges and focuses on the GHG emissions present across the value chain, and especially on the Scope 3 (upstream activities). The chapter also explores decarbonisation strategy implemented by agri-food companies to reduce their emissions and explores "climate-friendly" practices implemented by smallholder farmers. Finally, it presents the theoretical framework built from the theory, which is then used to conduct the case study and answer the research questions. Chapter 3 explains the research approach, the methods for the data collection and analysis, with reflection on the limitation of the data gathering. Chapter 4 presents the key findings of the case study and presents the answers to the sub-questions, which focuses on: (1) Unilever's strategy to decarbonise their palm oil value chain, (2) "Climate-friendly" practices implemented by Indonesian smallholder farmers to decarbonise their palm oil-related farming practices. Discussion, (Chap. 5) consists of a comparison of the results (Chap. 4 with the insights gained from the literature (Chap. 2). Finally, this research ends with a conclusion presenting the answer to the central question, limitations of this study, as well as recommendations for the palm oil sector and further research.

## 2. Theory and Analytical Framework

### 2.1. Sustainability challenges of palm oil production

Omnipresent in food products, cosmetics, cleaning products and in biodiesel production, a daily consumption of palm oil is almost inevitable. Palm oil, derived from *Elaeis guineensis*, was originally cultivated in humid tropics in Central and West Africa. However, as global production rose by 229% over the last 25 years, Indonesia and Malaysia became the largest palm oil producers (Alhaji et al., 2024; Qaim et al., 2020). As of 2024, their production accounts for over 80% of the global palm oil production, each producing respectively 59% and 24% (Foreign Agriculture Service, 2024). Primarily imported by China, India and then European Countries, the success of the palm oil is largely due to the growing global demand for vegetable oil, along with palm oil's unique versatile property and higher yields compared to other oil crops like soybean, rapeseed and sunflower (Pacheco et al., 2017; Qaim et al., 2020).

While the definitions of smallholder in the agricultural sector can vary per country or institution (Hasan et al., 2021), a more holistic definition of smallholder farmer will be used here, with Amar et al. (2023) defining smallholders as "[…] a vulnerable group of people cultivating small fields of land to feed their families and earn an income, mostly living in rural areas of countries in the Global South with limited access to financial resources and essential infrastructures" (p.6).

In Indonesia, the high increase of global demand for palm oil was seen as an opportunity by the Indonesian government to develop rural regions and reduce poverty (Qaim et al., 2020). However, although the palm oil expansion came with some socio-economic benefits, it also came with waves of criticism due to its environmental impact (Qaim et al., 2020). The palm oil boom brought new agricultural activities and employment, along with earning opportunities in poorer regions. With palm oil being more profitable than rubber (a highly competitive crop in Indonesia), its adoption generated higher incomes for smallholders (Qaim et al., 2020). As the rural incomes grew, it led to significant improvements of farmers' livelihoods with positive effects on education, nutrition, and asset ownership (Chrisendo et al., 2022).

Nevertheless, the expansion of palm oil plantations came with serious impacts on the environment. Common methods for plantation expansion, such as tropical forest clearance and

conversion of peatlands, have resulted in severe biodiversity and natural habitats loss, GHG emissions, soil degradation and a reduction of carbon pools (Okarda et al., 2024; Qaim et al., 2020). While deforestation has historically been driven by large-scale producers, smallholders are now significant contributors as they represent around 50% of the global palm oil production and are more likely to adopt high-emitting practices (Qaim et al., 2020; Reich & Musshoff, 2025; Touch et al., 2024). Factors such as difficult access to land property, knowledge and quality agricultural inputs (e.g. seeds, fertilisers), small farmers have been linked more frequently to illegal land clearing and forest conversion to compensate for lower farm productivity (Qaim et al., 2020; Reich & Musshoff, 2025).

Given its status of a highly controversial crop, excluding palm oil from the market and replacing it with other vegetable oils may not improve the current situation, as it could lead to greater land conversion and have severe consequences on its producers, such as small farmers, a population already facing many challenges (Qaim et al., 2020). Therefore, effective strategies must be implemented in the palm oil sector to reduce associated emissions while ensuring the inclusion of smallholder farmers to secure positive outcomes for them too.

## 2.2. Climate change and global agricultural commodities such as palm oil

The net increase of GHG emissions in the atmosphere due to human activities has led to an acceleration of climate change.

The AFOLU sector represents the third largest emitting sector with a responsibility of 13-21% of the global anthropogenic GHG emissions (IPCC, 2022). Within the AFOLU emissions inventory, more than 50% of the emissions come from $CO_2$ released by the LULUCF sector, with deforestation as the major driver (IPCC, 2022). The remaining comes from agriculture emitting methane ($CH_4$), mainly from enteric fermentation from livestock, and nitrogen dioxide ($NO_2$), principally due to nitrogen fertilisers (IPCC, 2022). In tropical regions such as Africa, Latin America and Southeast Asian countries, the LULUCF represents more than 50% of their AFOLU related-emissions (IPCC, 2022).

In these regions, deforestation has been proven to be largely associated with commodities production, greatly driven by international demand for crops such as palm oil, cocoa and coffee. In a study by Pendrill et al. (2019), between 2010 and 2014, in Indonesia, palm oil expansion was responsible for nearly half of the national CO2 emissions due to deforestation. While deforestation in some countries (e.g. Brazil) is primarily driven by commodity production for national consumption, 71–89% of the production of oilseeds (e.g. palm oil, soybeans) and 68-75% of crops like cocoa, coffee, tea and species are produced for export to regions such as China and Europe (Pendrill et al., 2019).

As a great driver of GHG emissions, the agriculture sector is also one of the most sensitive to climate change (Fleming et al., 2019). In regions with limited ability to adapt to climate change, farming activities could be heavily impacted, hence affecting production yields and all product-dependent related actors (e.g. smallholder farmers and agri-food companies). In the commodity market, Figure 1 highlights that the production of coffee, cocoa and palm oil is largely concentrated in a few countries that are highly vulnerable to climate change, such as Indonesia, India and Ivory Coast (European Environment Agency, 2021). As a result, commodity-importing regions like Europe, would also likely be impacted by climate-related interruptions in production.

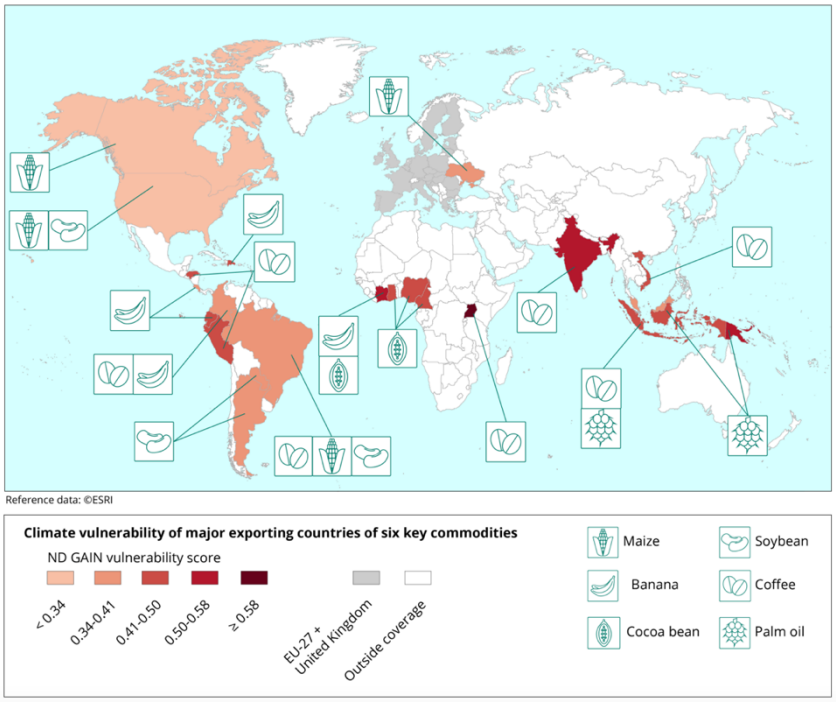


**Figure 1:** *Map of climate-related vulnerabilities of the major exporters of commodities (banana, cocoa, palm oil, coffee, maize and soybean). Map retrieved from the European Environment Agency (2021)*

In the palm oil sector, smallholder farmers, who produce around 50% of the global palm oil, are particularly at risk from climate change due to both the high climate vulnerability of their countries and their difficult socio-economic conditions (European Environment Agency, 2021; Qaim et al., 2020; Touch et al., 2024). These factors could significantly affect smallholder farmers' yields and overall livelihoods (Touch et al., 2024), with potential rebound effects on agri-food companies and all the actors involved in the palm oil value chain.

## 2.3. Palm oil value chain and GHG emissions

To mitigate the impact of climate change on the commodity market, it is crucial to reduce its associated GHG emissions. Moreover, the implementation of climate adaptation measures is essential so that all actors from the value chain, especially the most vulnerable, can sustain their activities, in the present and future, and secure their livelihoods despite potentially climate-related disruptions such as drought, flooding and sea level (IPCC, 2022).

Implementing a strategy to reduce GHG emissions in the palm oil value chain requires a clear mapping of the activities and related actors, and their associated emissions.

First, mapping the palm oil value chain is a true challenge (Bakhtary et al., 2020). From the production of fresh fruit bunches (FFB) to the consumption of end-products, a series of activities distributed across the globe involve multiple actors. In Figure 2, a simplified representation of the palm oil value chain shows the multiple actors and steps involved, going from small farmers, nations in the "Global South" to agri-food companies in palm oil-importing regions.

Following the GHG Protocol (2011), emissions can be classified into the scope 1,2 and 3. Scope 1 covers direct emissions owned by a company, Scope 2 includes emissions associated with the energy purchased, and Scope 3 accounts for any other indirect emissions from a company's value chain (GHG Protocol, 2011). In 2024, agri-food companies reported that their Scope 3 emissions averaged 85%[2] of their total emissions, with upstream and downstream activities accounting for 71%[2] and 14%[2] respectively (CDP, 2024). Also, around 65% of the total emissions were reported to come from the farming stage due to land use change (e.g. deforestation, land conversion) and agricultural practices (FAO, 2022). In the Scope 3 upstream activities – from farming to the refinery gate - the largest sources of emissions are located at the farming stage, representing 82% of upstream emissions, followed by the extracting stage via palm oil mills (17%) and the refinery (1%) (Schmidt, 2015).

At the farming stage, it is widely known that the expansion of palm oil has led to forest

[2] Note: While specific data on emissions across the palm oil value chain are currently limited, the percentages used are from the broader agri-food sector to illustrate the potential distribution of emissions across the palm oil value chain.

clearance via slash-and-burn and draining, and peatland conversion via draining, releasing a significant amount of GHG while severely decreasing the land's capacity to sequester carbon (Sundaraja et al., 2020; Tan et al., 2018). Moreover, "climate-unfriendly" agriculture practices can be a great source of emissions, such as the use of poor seedling quality, great use of chemical fertiliser, lack of replantation, plantation clearance using fire, burning plantation residues (e.g. trunk, leaves, empty FFB) and reliance on fossil fuel (Qaim et al., 2020; Schmidt, 2015; Siregar et al., 2024; Suardi et al., 2022; Tan et al., 2018). Additionally, to compensate for lower yields, smallholders have been considered to be a major driver for deforestation and peatland conversion to expand the plantation to increase yields (Schoneveld et al., 2019; Siregar et al., 2024). With limited access to knowledge, financial and technical resources, a continuity of high-emitting farming practices could occur among small farmers (Qaim et al., 2020).

Once harvested, FFB are transported to different mills where oil is extracted. At the palm oil extracting stage, the main source of emissions comes from mills' wastewater, emitting significant $CH_4$ emissions, and the use of fossil fuel energy (Bessou et al., 2014; Schmidt, 2015). Finally, the main source of emissions at the refining step is from the use of fossil fuel energy (Schmidt, 2015).

The main source of Scope 1 and 2 emissions, representing around 15% of the total, comes mainly from the type of energy source (GHG Protocol, 2011). Finally, the Scope 3 - downstream emissions (14%) are usually associated with the type of energy source used for transportation, the use and the end-of-life treatment (e.g. landfill, incineration, compost) (GHG Protocol, 2011).

Despite emissions occurring at various stages along the value chain, farming occurring at the Scope 3 upstream activities represents the largest part of emissions, which agri-food companies are trying to tackle.

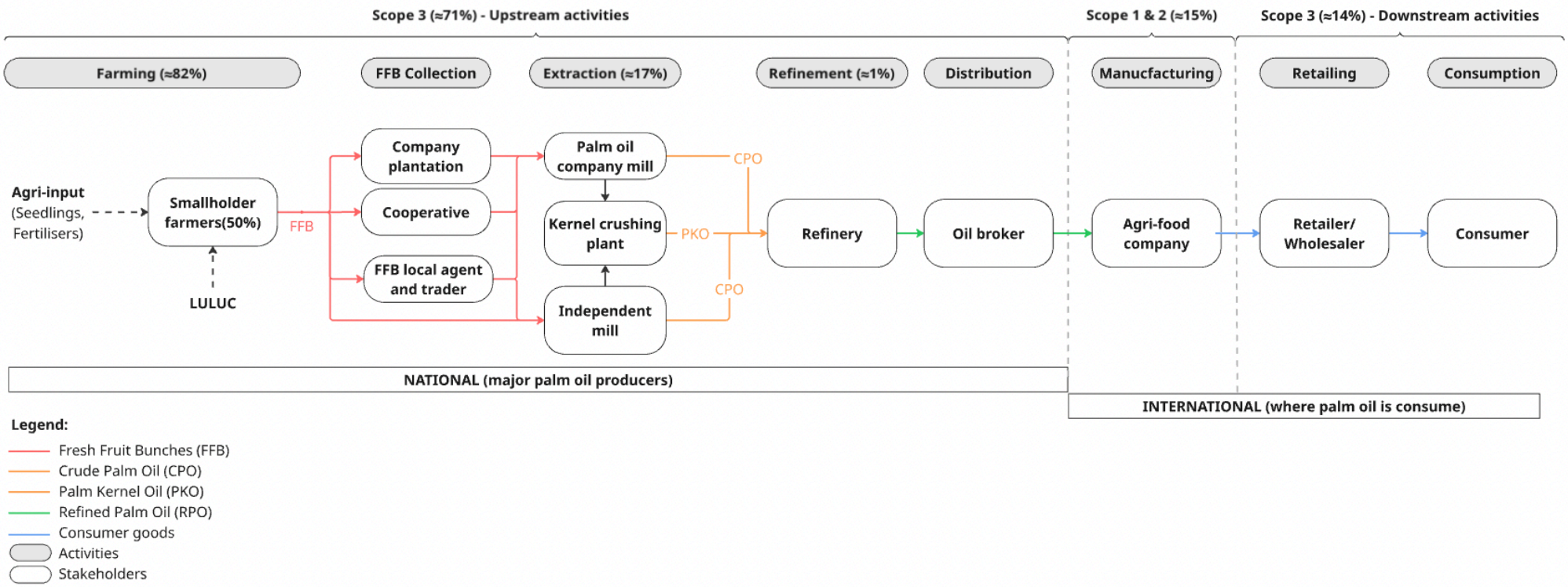


**Figure 2:** *Own graph built from the graphs and texts of van Noordwijk et al. (2017) Pacheco et al. (2017), Suharno et al. (2015), Suhartini et al. (2022)*

## 2.4. Decarbonisation strategy of agri-food companies

Representing their largest share of emissions, agri-food companies must address their emissions to comply with agreements (e.g. Paris agreement, EU Green Deal), new regulations (e.g. EUDR, CSDDD) and respond to demands from consumers and NGOs.

In the palm oil sector, palm oil-consuming companies are adopting strategies to reduce emissions along their palm oil value chain. These companies are focusing on reducing the Scope 3 (upstream activities)-related emissions as they represent the largest share of emissions and have been subject to a lot of criticism (Acampora et al., 2023). Although approaches to tackle emissions can vary depending on a company's objectives, a common strategy to decarbonise starts with calculating the company's carbon footprint, planning the emissions reduction with commitments and targets, and developing and implementing an actionable plan (Acampora et al., 2023). While some elements of a strategy can be applied to all the scopes, the following explanation focuses particularly on the strategy to tackle the emissions from the Scope 3 (upstream activities), as it represents a true challenge and the most significant one.

First, the quantification of the carbon footprint can be done by using the Life Cycle Assessment (LCA) approach, an approach that includes all the emissions from the raw material extraction until the disposal associated with a product or a service (Acampora et al., 2023; European Environment Agency, n.d.).

Second, planning the emission reduction is done by first committing to lower emissions and setting specific targets (Acampora et al., 2023). Anderson et al. (2023) suggest following the Science Based Targets initiative (SBTi) framework to set emissions and palm oil footprint reduction targets to align with the Paris Agreement. Moreover, in response to the consequences of deforestation and peatland conversion to expand crop land, agri-food companies in the palm oil sector are committing to halting deforestation and peat conversion with objectives like "no deforestation", "zero-deforestation", "No Deforestation, No Peat and No Exploitation (NDPE)", and "peat conversion free" (Anderson et al., 2023; Apriani et al., 2020; Bakhtary et al., 2021; FAO, 2018; Meijaard et al., 2018; Rahman et al., 2025). Additionally, with the rise in demand for palm oil with a lower environmental impact, actors in the industry created the Roundtable Sustainable Palm Oil (RSPO) certification to promote sustainable palm oil producing (Schmidt & De Rosa,

2020). Finally, companies are aiming for complete traceability of their palm oil value chain, considered crucial to demonstrating compliance with their commitments (Bakhtary et al., 2020).

Lastly, as the Scope 3 emissions fall outside of companies' direct control, companies "often pass on external pressures to their suppliers by requesting them to implement low-impact practices" (Acampora et al., 2023, p. 4). Therefore, to meet their commitments, palm oil companies commonly apply requirements to their suppliers (Bakhtary et al., 2020; Climate Bonds Initiative, 2025). These companies can require their suppliers to adopt specific practices (e.g. RSPO, GAP[3]) to produce or supply lower-emitting palm oil (Schoneveld et al., 2019). Moreover, some companies rely on moving away from palm oil to reduce their emissions by replacing palm oil with "lower-impact" alternatives (e.g. rapeseed oil), or even eliminating palm oil from their products (Lieke et al., 2024). However, compliance can be difficult for actors in the value chain with limited resources, and could risk exclusion from the market, as Bakhtary et al. (2020) argued; hence, to facilitate compliance with requirements, companies engage with actors in their palm oil value chain (Bakhtary et al., 2021; Bakhtary et al., 2020; Climate Bonds Initiative, 2025). Due to the important role of smallholders in the palm oil value chain, some companies offer farmers supporting programmes to make up for potential lack of knowledge, economic resources and legal documentation to comply with a company's requirements (Schoneveld et al., 2019). These programmes can include (1) technical support such as knowledge, skills and resources to improve farming practices (e.g. GAP), (2) financial support to facilitate access to credit and increase financial competencies, (3) institutional support to secure land tenure and (4) technological support to improve farm infrastructure and facilitate communication (Bakhtary et al., 2020). While these programmes offer a wide range of support, Bakhtary et al. (2021) argued that these are often mainly designed to ensure compliance with a company's requirements (e.g. certified RSPO), and meaningful impact and long-term changes remain unclear. Also, in general, these programmes remain limited in number and participation from smallholders with limited access to minimum resources and general support (Bakhtary et al., 2020). Finally, companies also

[3] Promoted by the Food and Agriculture Organisation (FAO), Good Agriculture Practices (GAPs) take into account environmental impact and the health and safety of workers.

engage with external actors from the value chain, such as NGOs, state actors, private companies in the sector, and Indigenous Peoples and Local Communities to find broader solutions (Bakhtary et al., 2021; Climate Bonds Initiative, 2025). An example is the creation of the RSPO, which is the result of an international co-operation of NGOs, palm oil producers, manufacturers and retailers, among others (RSPO, n.d.-b). Table 1 presents a resume of the agri-food company's strategy to decarbonise their palm oil Scope 3 - upstream activities.

**Table 1**: *Resume of Scope 3 (upstream activities) decarbonisation strategy of the palm oil value chain by agri-food companies*.

| Strategy | Examples from the literature with brief definition | Source |
|---|---|---|
| **Commitment** | **GHG emissions reduction goal -** Setting a target for reducing emissions within a timeframe aligned with the Paris Agreement | (Anderson et al., 2023) |
| | **No deforestation and no peat conversion –** Halting or limiting deforestation and peat conversion in the value chain | (Anderson et al., 2023; Apriani et al., 2020; Bakhtary et al., 2021; FAO, 2018; Meijaard et al., 2018; Rahman et al., 2025) |
| | **Sustainable palm oil sourcing –**Sourcing palm oil with minimum environment impact | (Schmidt & De Rosa, 2020) |
| | **Complete traceability –** Sourcing palm oil from traceable sources | (Bakhtary et al., 2021) |
| **Action** | **Supplier sourcing requirements –** Sourcing from suppliers that meet defined criteria | (Bakhtary et al., 2020; Climate Bonds Initiative, 2025) |
| | **Palm oil reliance reduction –** Limiting the use of palm oil in products | (Lieke et al., 2024) |
| | **Value chain engagement –** Supporting and collaborating with actors in the value chain | (Bakhtary et al., 2021; Bakhtary et al., 2020; Climate Bonds Initiative, 2025) |
| | **External engagement -** Supporting and collaborating actors outside the supply chain | (Bakhtary et al., 2021; Climate Bonds Initiative, 2025). |

## 2.5. "Climate-friendly practices" by smallholder farmers

As argued by many authors, due to their socio-economic situation, smallholders may resort to unsustainable farming practices (Qaim et al., 2020; Siregar et al., 2024). As identified by Wreford et al. (2017), Acampora et al. (2023) and Jelsma (2019), smallholders may face economic barriers such as insufficient financial resources for land ownership, investment in farming technologies, infrastructure, and training to adopt "climate-friendly practices", practices aiming to reduce GHG emissions or sequester carbon emissions. Also, on the social side, ageing farmers, limited access to education and knowledge and perception of the negative effects of climate change on their plantations can hinder changes in their practices.

However, despite these barriers, many studies have also shown that smallholder farmers present low-emission practices. To avoid emissions related to land use change (e.g. deforestation, peatland conversion), some palm oil small farmers cultivate on land already used or dedicate a portion of their land for conservation, allowing possible additional income through an environmental compensation program (Abas et al., 2022). "Climate-friendly" agricultural practices include the use of organic waste as fertiliser instead of chemical fertilisers, the transformation of palm oil plantation residues into biomass energy to reduce GHG emissions, crop rotation and replanting, which can enhance carbon sequestration and limit land expansion (Bakhtary et al., 2021; Ernah et al., 2016; IPCC, 2022; Petri et al., 2024; Schoneveld et al., 2019; Susanti et al., 2020). While practised at a limited scale and with mitigated perceptions on its overall benefits, agroforestry has also been adopted by some palm oil smallholder farmers (Susanti et al., 2020). Agroforestry is a land-based practice combining different crops with animal farming to enhance carbon sequestration, with the potential to diversify incomes (IPCC, 2022; Susanti et al., 2020). Finally, due to external reinforcement, common practices follow principles from the RSPO or the Indonesian Sustainable Palm Oil (ISPO) certification in Indonesia (Bakhtary et al., 2021; Ernah et al., 2016; Schoneveld et al., 2019).

Finally, supporting activities enabling overcoming financial and social barriers include forming cooperative or groups of farmers to support each other and collectively boost financial income and household income stability, taking part in diverse trainings, and promoting palm oil

farming to female and young population (Acampora et al., 2023). The Table 2 resumes "climate-friendly" practices implemented by palm oil smallholder farmers.

**Table 2**: Resume of current "climate-friendly" practices implemented by palm oil smallholder farmers

| Activities | Definition and examples | Source |
|---|---|---|
| **Land use change reduction** | **Efforts to halt, limit and avoid deforestation and peatland conversion into cropland** (e.g. farming on already explored land, reserve land areas for conservation) | (Abas et al., 2022; IPCC, 2022; Susanti et al., 2020) |
| **"Climate-friendly" agricultural practices** | **Practices to reduce emissions from working the land** (e.g. use of organic fertiliser, biomass transformation, agroforestry, crop rotation, replanting, practices from RSPO and ISPO certifications). | (Bakhtary et al., 2021; Ernah et al., 2016; IPCC, 2022; Petri et al., 2024; Schoneveld et al., 2019; Susanti et al., 2020) |
| **Social and economic empowerment** | **Actions to improve farming-related income and social conditions** (e.g. remuneration for land protection, follow trainings, practice community inclusion and organise groups) | (Abas et al., 2022; Acampora et al., 2023; Jelsma, 2019) |

## 2.6. Analytical Framework

Building on the insights from the previous chapter, Chap. 2.4 and Chap. 2.5, this study focuses on exploring current practices implemented by Indonesian palm oil smallholder farmers to decarbonise their agricultural practices, and Unilever's strategy to decarbonise their Scope 3 palm oil-related upstream activities. Moreover, previous chapters revealed that some climate-friendly practices, such as agroforestry or RSPO, may be beneficial for the company in terms of emissions reductions while having a negative economic impact on smallholder farmers. Therefore, this study is also looking at the synergies and trade-offs between Indonesian smallholder practices and Unilever's strategy. The interaction between both will be assessed in terms of synergy ('win-win' cases) and trade-off ('win-lose' cases). A 'win-win' scenario enables smallholders to earn higher income while allowing Unilever to reduce their emissions.

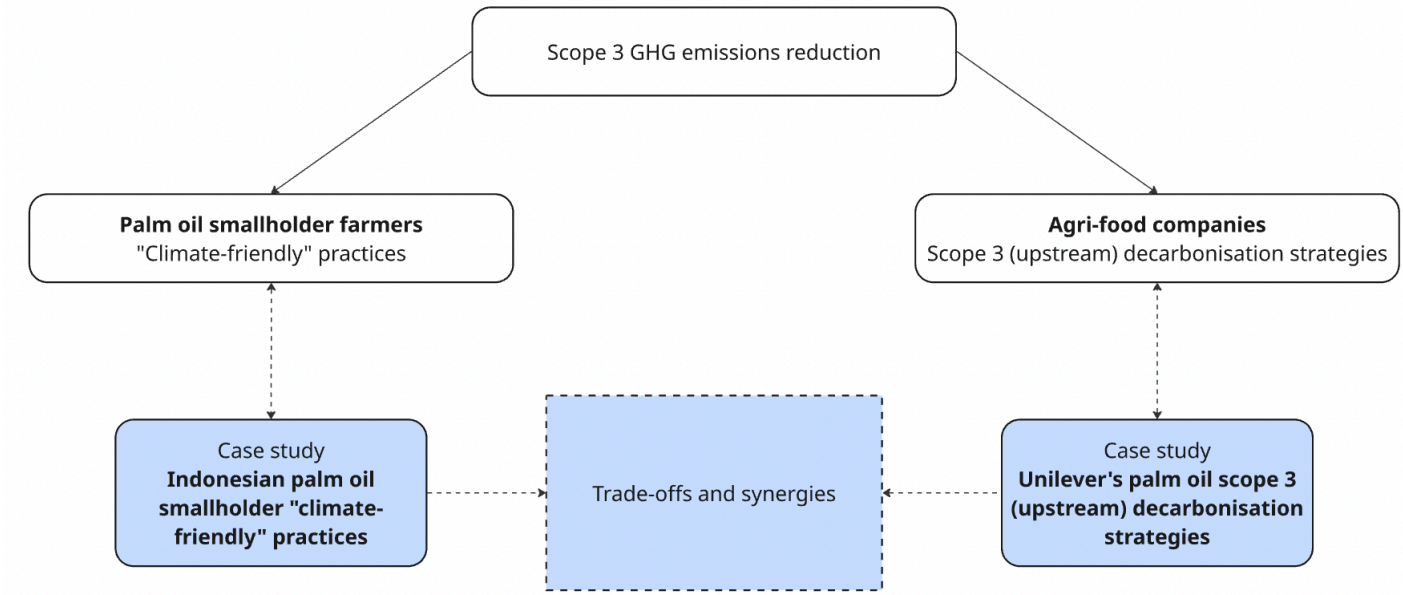


**Figure 3**: *Framework – own graph*

# 3. Methodology

This chapter presents the details of the methodology used to answer the research questions and a reflection on its limitations.

## 3.1. Research approach and design

The research questions were answered using a qualitative research approach. A literature review was first conducted to understand the key concepts relevant to this study, and the research questions were answered by applying the analytical framework developed in Chapter 2 to a single case study.

The literature review was built on findings from academic journal articles, governmental and non-governmental documents and standards on topics related to sustainable farming practices, climate change, decarbonisation strategy, palm oil value chain, smallholder farmers, and agri-food businesses, among others. As this study includes terms from different fields, databases such as Scopus, Web of Science, and Google Scholar were used as they include papers from a wide variety of disciplines. To find additional relevant papers, the citation chaining method was used, and the selection of the relevant papers was done based on the language (English), relevance to the topic and the easy accessibility of the document.

Finally, due to limited time, this study focuses on a single case study. The study explores the strategy of an agri-food company, Unilever, to decarbonise their palm oil Scope 3 (upstream activities) related emissions, and practices implemented by smallholder farmers in Indonesia to decarbonise their palm oil-related farming activities.

***Brief introduction of Unilever***

Unilever is now one of the largest manufacturers offering consumable goods, going from personal and home care products to food products (Unilever, 2025a). Unilever relies on palm oil for many of their food such as mayonnaise, margarine, cookies and ice cream and non-food products like soaps. According to the company, about 51-60% of their revenue is dependent on the palm, making it a significant commodity for Unilever (Unilever, 2024d). In 2023, Unilever's palm oil consumption was estimated at over 700,000 tonnes, representing about 1% of the global

palm oil production (see Appendix A for calculation details) (Foreign Agriculture Service, 2024; Unilever, 2024d). In 2023, the company sourced the majority of its ingredients from Indonesia (63%) and Malaysia (22%), primarily from large palm oil plantations and smallholder farmers (Unilever, 2024d, n.d.-a) (see Appendix A for calculation details). In 2025, the company published their first report under the CSRD, where they reported emitting 54.49 million tonnes of CO2 equivalent (CO2e) (excluding indirect consumer use[4]), with around 7% of these total emissions attributed to the palm oil value chain (Unilever, 2024d, 2025a) (see Appendix A for calculation details). Figure 4-1 represents the company's share of emissions. "Raw materials (e.g. palm oil) and ingredients" include the total emissions for farms to Unilever's site and account for more than half of the Scope 3 upstream activities emissions. Moreover, emissions from the production of Unilever's forest-risk commodities (e.g. cocoa, palm oil, soy…) come from the land use change (e.g. deforestation), agriculture practices, and downstream processing (e.g. palm oil extraction, refining, manufacturing…) (see Figure 4-2); with palm oil constituting their highest forest-risk commodity (Unilever, 2025a). In response to the high impact of palm oil, Unilever implemented a strategy to decarbonise its palm oil-related emissions across their value chain.

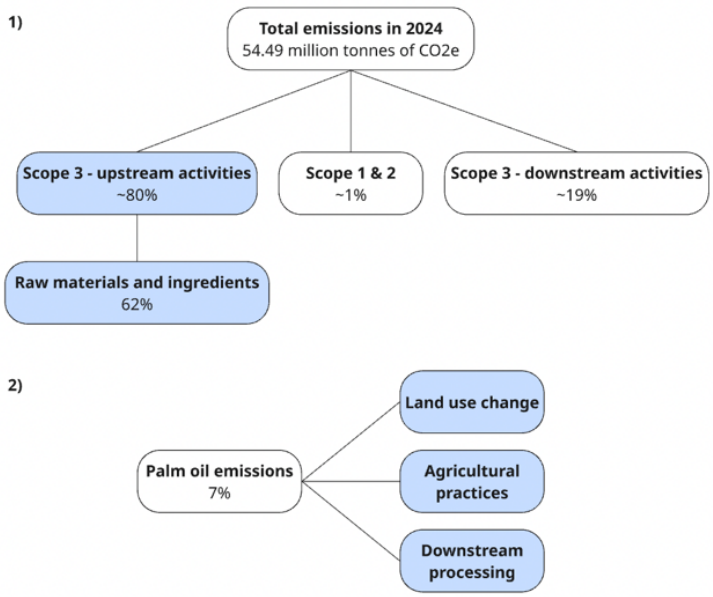


**Figure 4**: *Own graph: 1) Unilever's emissions distribution, 2) Main source of palm oil value chain emissions. (see Appendix A for calculation details)*

[4] Consumer use emissions are associated with the product usage, in downstream emissions. As these emissions are also excluded from the decarbonisation scope of Unilever's, these emissions were also excluded in this study.

***Brief introduction of palm oil smallholder farmers in Indonesia***

In Indonesia, it is estimated that 38% of palm oil producers are smallholders, and their production accounts for around 35% of the national palm oil production (Hasan et al., 2021). In Indonesia, smallholder farmers can be divided into two broad categories: (1) 20% are "scheme smallholders" and (2) 80% are independent smallholders (Pacheco et al., 2017; Suharno et al., 2015). Scheme models include (1) smallholders independently organised in groups or cooperative where they can benefit from agri-inputs (e.g. seedling, fertilisers), land certificates and working with company mill, and (2) "plasma farmers" associated with state or private palm oil company where they can benefit from access to land, agri-inputs, financial and technical support (Hasan et al., 2021; Pacheco et al., 2017; Suharno et al., 2015; Watts et al., 2021). In contrast, independent farmers are not linked to any scheme, receiving overall limited access to support besides available government assistance (Hasan et al., 2021; Watts et al., 2021). In this case study, the focus is only on the Indonesian "independent smallholder farmers" (hereafter also referred to as smallholder, small-farmers, ISH or SH), as they present limited resources and access to support.

## 3.2. Methods for data collection (documents and interviews)

To answer the research questions, primary data were obtained from semi-structured interviews, and secondary data from the grey literature (e.g. reports, websites, newspapers, webinars).

***Semi-structured interviews***

Semi-structured interviews were chosen to ensure a direction to the conversation while also leaving room for natural conversation and unanticipated insights. To ensure a diversity of insights on the situation, participants from different organisations and roles were contacted. Tables 3 and 4 resume the type of potential participants contacted, the number of interviews conducted and details on interviewed participants.

**Table 3:** *Resume of participants reached out*

| Group of participants | Contacted | Interviewed |
|---|---|---|
| Organisation active in Indonesia | 9 | 1 |
| Palm oil-producing independent smallholder farmers in Indonesia | 3 | 0 |
| Palm oil certification body | 1 | 1 |
| Researchers | 2 | 0 |
| Unilever | 25 | 0 |
| **Total** | **40** | **2** |

**Table 4:** *List of participants interviewed and code*

| Code | Role in the organisation | Organisation name | Based in | Form | Date |
|---|---|---|---|---|---|
| **P1** | Supply Chain and Livelihood Transformation Senior Manager | WRI - Organisation active in Indonesia | Indonesia | Online discussion | July 9, 2025 |
| **P2** | Senior Executive of Research and Knowledge Management | RSPO – International palm oil certification body | Indonesia | Written | July 7, 2025 |

To gain more insights on Unilever's palm oil value chain decarbonisation strategy, current employees at Unilever were contacted via various channels (e.g. company online form, company email, LinkedIn, personal contact); however, no response resulted in an interview. The selection of potential participants was based on their role within the organisation (e.g. managers, directors, business operations, business leaders) in the relevant domain (e.g. sustainable sourcing, procurement, palm oil) and preferably located in Indonesia. Snowball sampling was also used to reach out to more suitable participants for the study and to increase the possibility of speaking with Unilever, the location-based search was expanded to include people located in Singapore, the Netherlands, the United Kingdom and the United States of America.

On the small farmers' side, possible participants were selected based on their location, in Indonesia, and their profile – palm oil small farmers, smallholder cooperatives. Names of potential participants were found in research papers and reports reviewed for the literature review and contact information were found on farmers or NGOs websites in contact with them.

Due to the language barrier, online interviews were not possible, and submitted questions were never returned.

Finally, NGOs and experts in the sector were also contacted and selected based on their role and potential collaboration with small farmers and/or Unilever active in Indonesia. Relevant NGOs and experts were found via the supervisor network, webinar on palm oil, social media, and research papers reviewed for the literature review.

***Grey literature***

To complement the interviews, documents from the grey literature were also analysed.

To uncover Unilever's palm oil decarbonisation strategy, the company's reports, website, social media, videos and internal policy documents were reviewed. In addition, newspapers and external documents about Unilever were examined to add nuance to or support the company's perspective. The analysed documents were selected based on their relevance to SQ-1, hence addressing the following topics: Unilever, sustainability, palm oil, decarbonisation, GHG emissions, value chain, farmers, and strategy.

To answer SQ-2, which documents farmers' practices, websites and social media of farmers' organisations were reviewed, as well as webinars, reports, palm oil certification documents and articles from NGOs that report and/or research on smallholder farmers and agri-food companies in palm oil sector.

## 3.3. Methods for data analysis

The data from both the document analysis and interviews were analysed using thematic coding, using both a deductive and an inductive approach (see code book in Appendix C). First, the documents and interviews were reviewed using a deductive approach, categorising the collected data by the codes created using the frameworks previously presented (Tables 1&2). Then the inductive approach was used to extract relevant elements that had not been previously considered.

## 3.4. Reflections on data gathering

The data collected from both interviews and the grey literature present several limitations.

First, regarding the collection of primary data, no interviews with the targeted group, Unilever and Indonesian palm oil small farmers were conducted. Therefore, the elements present in Unilever's strategy were mainly based on available public documents and personal understanding of the strategy. Direct insights from the company could have improved the completeness of the strategy later presented in the Results section. However, in a personal communication with Unilever's sustainable department in Indonesia, the company noted that "only documents that do not involve confidential information will be shared" (Unilever, personal communication, June 24, 2025). Hence, it is unclear if speaking with an employee at Unilever would have provided more insights.

On the farmers' side, while one farmer organisation seemed willing to participate through written answers due to the language barrier, no further answers were ever received. Without direct input from farmers, the data used to uncover farmers' practices relied on NGOs' publications, standards of the industry, knowledge from the interviewees and researchers. Hence, the representation of current farmers' practices and their associated challenges may not be accurate. While documents from Indonesian farmer organisations exist, reviewing them was excluded from my research due to language barriers and time constraints to invest efforts in translating each document. Two interviews with relevant actors in the industry were conducted, with one in writing and the other online. Unfortunately, the writing interview did not allow for easy follow-up questions; hence, gaining more insights based on the person's view and experience was difficult to obtain. For the online interview, time limitations made it difficult to ask for many follow-up questions, and the language barriers and internet quality made it challenging to have a fluid and clear conversation.

# 4. Results

This chapter presents the results of the document analysis and the interviews through the lens of the theoretical framework introduced in Chapter 2. The following results are structured around the two sub-questions: What strategy does Unilever have to decarbonise their Scope 3 (upstream activities) palm oil value chain? (SQ-1) and What practices do smallholder farmers in Indonesia implement to decarbonise their palm oil-related farming activities? (SQ-2).

## 4.1. Unilever's strategy to decarbonise its palm oil value chain

Based on the document analysis, since 2016, Unilever has not presented a specific strategy for reducing the impact of their palm oil value chain; instead, it merged with the general company strategy for unknown reasons (Unilever, 2016, 2024a). Hence, while Unilever does not explicitly present a decarbonisation strategy for its palm oil value chain, the strategy presented below includes commitments and actions from the general decarbonisation of the company's total emissions, which could also apply to the decarbonisation of their palm oil value chain.

*Commitments*

**GHG emissions reduction goal –** Unilever has committed to reducing its total company's Scope 3 emissions by 39.5% by 2030 compared to the 2021 level (Unilever, 2025a). Also, the company also aims to reduce its Scope 3 Forest, Land and Agriculture (FLAG) GHG emissions, those from agricultural activities such as land use change and land management, including palm oil farming, by 30.3% by 2030, using 2021 as the baseline (Unilever, 2025a). However, Unilever does not appear to have set a specific emissions reduction target for the palm oil value chain only. Based on the company data, between 2021 and 2024, the total GHG emissions of Unilever increased by 60% while the total FLAG emissions decreased by 14% (see Figure 5, reference for data and calculation can be found in Appendix B). Between 2021 and 2023, emissions associated with the palm oil value chain rose by 30% (See Figure 5). Therefore, looking only at the total company or the FLAG emissions does not indicate the evolution of the emissions from the palm oil value chain only. Even if the overall company or FLAG emissions decrease, emissions from the palm oil could still be increasing.

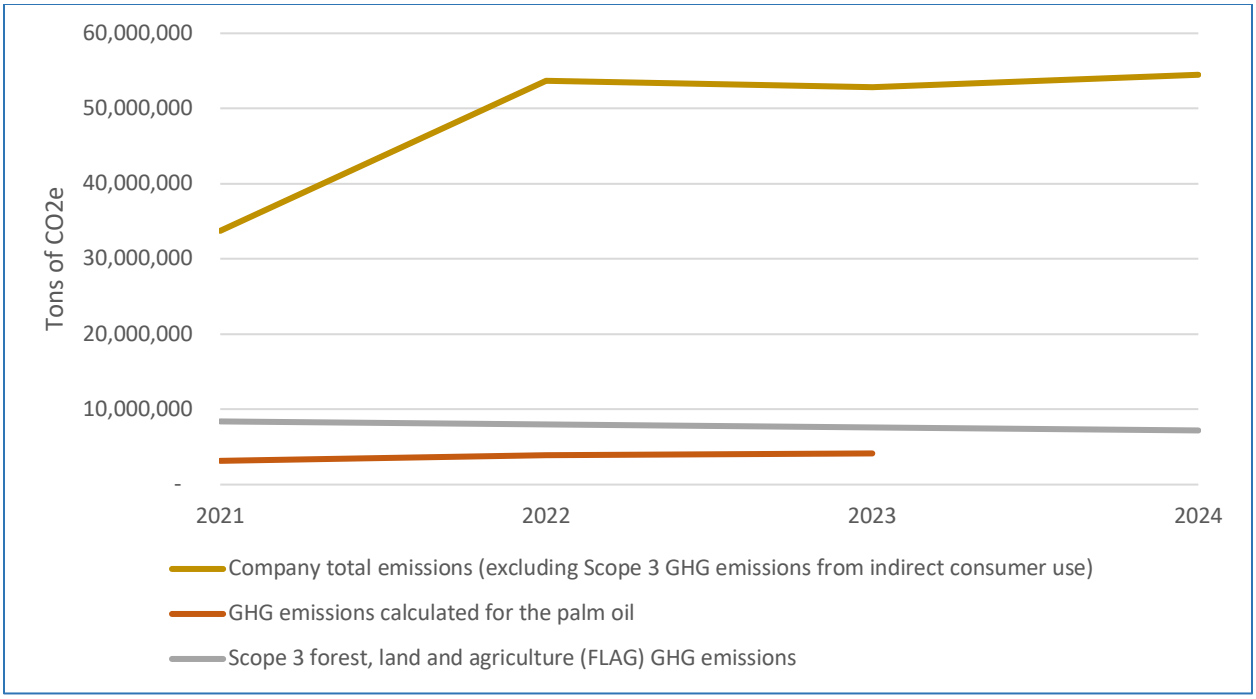


**Figure 5**: *Own graph - Evolution of the total company's (excluding consumer use) and FLAG emissions, and the palm oil-related emissions between 2021 (target baseline) and 2024. Source of data: (Unilever, 2021a, 2022c, 2022d, 2022e, 2023b, 2023c, 2023d, 2024d, 2025a)*

Moreover, tracking the evolution of the emission does not clearly inform on the impact of the efforts done to decarbonise the palm oil value chain. While the palm oil-related emissions increased between 2021 and 2023, Unilever claimed in 2022 that almost all of their palm oil had a lower GHG impact than the industry average (Unilever, 2023c). However, this claim does not provide a clear picture of the company's actual palm oil footprint or the effectiveness of its reduction efforts. In Figure 6, the graph presents an estimate of Unilever's palm oil footprint (see Appendix B for data sources). The graph shows that the carbon footprint of the palm oil increased by 57% between 2021 and 2023 and by 94% between 2019 and 2023. In 2021, the company justified the significant increase by using higher GHG emissions factors in calculating their palm oil value chain emissions (Unilever, 2022d), and later claimed a possible "over estimat[ion] [of] our Palm footprint due to the inclusion of non-palm ingredients" (Unilever, 2024d, p. 290).

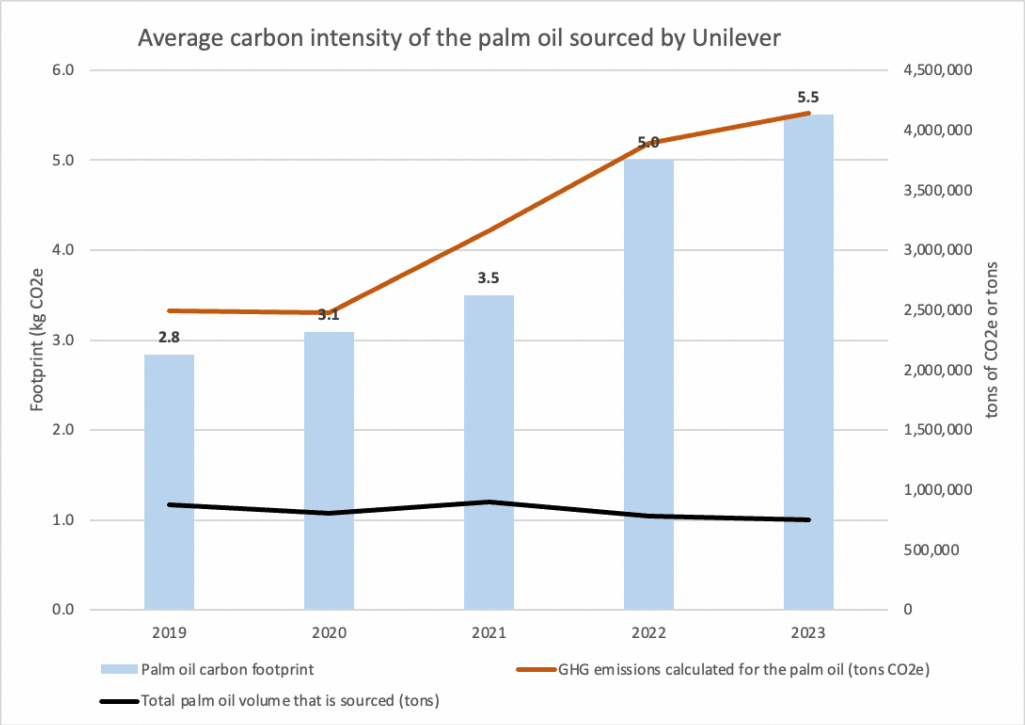


**Figure 6:** *Own graph - Evolution of palm oil footprint, Unilever's GHG emissions of the palm oil value chain and the volume of palm oil sourced by Unilever between 2019 and 2023. Data source: (Unilever, 2020a, 2020b, 2021b, 2021c, 2022d, 2022e, 2023c, 2023d, 2024d)*

**No-deforestation and no peat conversion –** Since 2020, Unilever has committed to sourcing palm oil from deforestation- and conversion-free areas (Unilever, 2024b). With the upcoming EU regulation on deforestation (e.g. EUDR), the company will be required to comply with it (Unilever, 2025a). As part of their deforestation-free claim, the company also includes halting peat conversion, as Unilever defines deforestation as the "[l]oss of natural forest as a result of: i) conversion to agriculture or other non-forest land use; ii) conversion to a tree plantation; or iii) severe and sustained degradation" (Unilever, 2022a, p. 5). To claim their deforestation-free performance, the company assesses their sourced palm oil based on their suppliers' compliance with EUDR or their internal verification protocol or the Identity Preserved (IP)[5] or Segregated

[5] Identity Preserved (IP) – The certified palm oil comes from a single identifiable certified source, and it is kept separately from the rest of the palm oil throughout the supply chain (RSPO, 2025).

(SG)[6] RSPO-certified palm oil (Unilever, 2025a). While Unilever accepts the two types of RSPO certification to claim their "deforestation-free" palm oil, the RSPO organisation has noted that, "there are also certain differences between the RSPO Standards and the EUDR, which mean that companies will need to provide additional information (compared to the RSPO Standards) to demonstrate compliance [with EUDR]" (RSPO, 2025). By the end of 2024, Unilever claimed that 95,7% of their palm oil was sourced from deforestation-free areas (Unilever, n.d.-b). Although the company had previously committed to achieving 100% deforestation-free palm oil by 2023, they have not shared a clear explanation for failing to meet their goal. In addition, Unilever revised their target from 100% to 95% in 2024 (Unilever, 2023b, 2025a).

**Sustainable palm oil sourcing** – Unilever is committed to sourcing sustainable palm oil. In 2023, the company aimed to source 100% sustainable palm oil, but this target was not achieved without providing further explanation. Later, in 2024, their objective went down from 100% to 95% (Unilever, 2023a, 2025). By the end of 2024, the company claimed to have sourced 82% of their palm oil from sustainable sources (Unilever, n.d.-b). This claim is based on 62% of palm oil being sourced through certified RSPO Mass Balance[7] or RSPO Segregated (SG) supply chains, or by meeting internal standards (e.g. SAPs[8]), and an additional 20% being covered through the purchase of RSPO Independent Smallholders (ISH) credits[9] to compensate for the use of non-certified palm oil (RSPO, n.d.-a; Unilever, n.d.-b). Hence, less than 62% of the palm oil used by Unilever was produced sustainably. Finally, in June 2025, Unilever was criticised by a Dutch Consumer Association (DCA), which called out Unilever for misleading consumers with the use of the word "sustainable" on products, including products containing palm oil; the term was

[6] Segregated (SG) – The palm oil come from different certified sources that is kept separate from the rest of the palm oil throughout the supply chain (RSPO, 2025).
[7] The Mass Balance (MB) – The certification includes the mixing of RSPO and non-RSPO certified palm oil (RSPO, 2025).
[8] The Sustainable Agriculture Principles (SAPs) are a set of requirements and guidelines for both farmers and suppliers to reduce their impacts and acquire the "sustainably sourced" status from the company. For more information, https://www.unilever.com/files/unilever-sustainable-agricultural-principles-2024.pdf
[9] RSPO Certified Independent Smallholders credits can be purchased, so certified farmers can earn additional income for their efforts. One RSPO credit is equivalent to one tonne of palm oil produced by an RSPO Certified palm oil producer (RSPO, 2025).

considered vague, with limited transparency regarding the information behind it (Cammelbeeck, 2025).

**Complete traceability –** Unilever is also committed to increasing the traceability of its palm oil value chain (Unilever, n.d.-b). Unilever shared that the "first mile" of their palm oil is often the most critical and challenging to trace, as sustainable-verified and non-verified palm oil can be easily mixed at that stage and leading to incorrect information about the type of palm oil sourced (Unilever, 2022b). The company stated that they are "stepping up [their] engagement with suppliers and smallholders while increasing the traceability and transparency of [their] supply chain" (Unilever, n.d.-b). Improving the traceability is considered essential for achieving and showing compliance with their deforestation-free and sustainability sourcing commitments (Unilever, n.d.-a, n.d.-b). To show proof of their commitment, the company shares public lists of their suppliers (Unilever, n.d.-a).

*Implementation plans*

To achieve their commitments, the company's action plans include reducing reliance on palm oil, implementing requirements for palm oil sourcing/production, engaging with actors in and out of the value chain, and other actions.

**Supplier sourcing requirements –** To be part of Unilever's palm oil value chain, suppliers must comply with the company's list of requirements, or an exclusion could occur (Unilever, 2024e). Additionally, to qualify as providing "sustainable and deforestation-free", suppliers must meet additional requirements. As mentioned previously, suppliers need to demonstrate compliance with Unilever's internal standards (e.g. RSPO, SAPs, EUDR, internal protocol). While these requirements are valid for some time, Unilever also updates them over time (Unilever, 2016, 2025b). As P1 mentioned, "[the best agriculture practices are] evolving, but they *(Unilever)* have, at least, […] a kind of willingness to accept any new ideas on the best approaches" (P1; see the full interview transcripts in Appendix B). While complying with the company's requirements is "easier" for larger plantations, it is not the case for independent smallholders (Solidaridad et al.,

2025, p. 15)**.** Both interviewees, P1 and P2, explained that complying with a company's requirements may not be feasible (P1; P2) or even attractive (P1) for Indonesian smallholder farmers. First, P1 explained that smallholders are "left behind in terms of […] incomes, access to education, access to infrastructure and so on, […] so sudden change is not something that [is] easy to address" (P1). P2 also added that **"**[t]he adoption of [RSPO's sustainable farming practices] by smallholders is driven and constrained by several key factors. Financial and technological limitations remain major challenges" (P2). Moreover, a lack of perception on the ground for the need to change could hinder farmers from adopting low-emitting practices. P1 reported that "on the ground, all those unsustainable fruits, […] even the fruit from deforestation area [are] still accepted by palm oil mills. So, why should we *(independent farmers)* change? There's no specific treatment for those unsustainable products" (P1). As P1 also argued, the European market for palm oil is far smaller than the Asian market (e.g. India, China, Pakistan), so the need to comply with European regulations may not currently be a priority if other more important markets do not impose similar requirements (P1). However, P1 acknowledged that this deforestation-free requirement still has an impact, as it can serve as a benchmark and argument to influence broader transformation at both the national and industry level (P1).

**Palm oil reliance reduction –** According to Unilever's 2024 emissions reduction plan , the company planned to reformulate their products (e.g. soap bars) to include less palm oil and replace it with lower-GHG-impact ingredients, such as a "combination of starches, natural fatty acids and vitamins" (Unilever, 2024a; 2025a, p. 21). Although the company appears to have sourced lower volume of palm oil over the years (except in 2021; see Figure 6), evidence that this action has contributed to lowering the emissions is unclear, as the company's overall emissions have increased (see Figure 5). In addition to using product reformulation as a way to reduce emissions, the company also justified it as a way "to address cost fluctuations, particularly for commodities like palm oil […]"(Unilever, 2025a, p. 21).

**Value chain engagement –** Unilever engages with different stakeholders across their palm oil supply chain to implement actions that support progress towards their commitments. The

company shows engagement with different actors including large, medium and smallholders, as well as mills and refineries.

- **Engagement with independent smallholders farmers engagement** – Unilever does not disclose the percentage of smallholders they engaged with from their palm oil supply chain; but in 2024, they claimed to have support 80,000 smallholders in their entire company value chain (Unilever, 2025a). The company recognises that ISH are " […] generally unsupported and have no permanent ties to a larger plantation or mill. They *(ISH)* often have low productivity and low-quality trees, and cannot afford technical advice to improve the situation, which puts more pressure on forests" (Unilever, n.d.-a). The company claimed that working closely with smallholders is primordial in the palm oil industry and "[taking] into account the needs of smallholders [to] help the industry achieve higher levels of sustainability, traceability and transparency […]" (Unilever, n.d.-a). Unilever engages with smallholders by offering training programmes and purchasing RSPO ISH credits (Unilever, 2025a). Through these training programmes, Unilever provides technical, financial and legal support, training to implement the company's GAPs, called SAPs, and assistance to acquire certifications (e.g. RSPO, ISPO) (Unilever, n.d.-a). As a result, the company claims that their support has improved the sustainability and productivity of SH and income (Unilever, n.d.-a). This engagement approach reflects an example of "transition[ing] from buyers imposing a checklist of sustainability requirements, to systematically supporting suppliers to produce sustainably" as explained by Solidaridad et al. (2025, p. 50). However, it is unclear whether the duration of Unilever's engagement with SH is punctual or long-term. According to Wong, a participant at the Solidaridad[10]'s 2025 webinar on palm oil, "getting into the palm oil industry […] is a 20–25-year investment, as it is also the plantation's lifetime. […] to put the right program in place and really create long-term changes, the company needs to offer constant long-term support" (20:49 to 21:10). Suhada et al. (2018) also shared a similar view, stated that "[ISH] will find it difficult to maintain their sustainable certification once support from an

[10] Solidaridad is an international organisation, active in Indonesia, that works to make the global supply chain of commodities more inclusive and sustainable.

NGO or company ends". Unilever claims to be the largest buyer of RSPO ISH credits to support certified farmers not yet connected to their value chain (Unilever, n.d.-a). While P1 recognised the potential of RSPO ISH credits as an incentive for smallholders to improve their practices (P1). P1 also argued that, due to the price instability of these credits, guaranteeing a premium price for producing certified palm oil is no longer possible. Hence, there is a "danger" in using this as an argument to persuade ISH to adopt better practices if the expected financial benefits can't always occur (P1). A report prepared by Solidaridad showed evidence of the decreasing value of the RSPO ISH credits over the years, linking this trend to the apparent unwillingness of palm oil buyers to pay premium prices (Solidaridad et al., 2025). The report quoted a trader saying that "if our buyers don't want to pay the RSPO premium, we do not pay the premium to farmers" (Solidaridad et al., 2025, p. 26). Nevertheless, the NGO still recognises these RSPO ISH credits as an opportunity "to promote smallholder inclusion" (Solidaridad et al., 2025, p. 52). To overcome the many barriers to include ISH, P2 proposed notably a "[c]ollaboration and tailored support could be essential to overcoming […] barriers (*faced by ISH*)".

- **Engagement with large and medium plantations** – Unilever claims that the majority of their palm oil is sourced from large and medium plantations (Unilever, n.d.-a). Since Unilever began sourcing from these plantations, the current new requirements (e.g. deforestation-free, sustainable sourcing, traceability…) did not apply (Unilever, n.d.-a). Hence, the company is also supporting their adjustment by providing "resources, funding and technical expertise" (Unilever, n.d.-a).
- **Engagement with mills, crushing plants and the refinery -** Unilever also engages with mills, crushing plants and refineries to ensure they meet the company's requirements. Unilever offers training and collaborates with these actors and others to improve the traceability and transparency of the palm oil value chain (Unilever, n.d.-a). However, the specific impacts of these interactions on these actors (e.g. income gains, emissions reduction) remain unclear.

**External engagement -** Unilever collaborates with actors external to their value chain (e.g. local government, NGOs, agri-food companies, other private companies) to improve sustainability in the sector and ensure progress in their own commitments.

- **Co-founder of certification body** – In 2004, Unilever co-founded the RSPO certification to improve the sustainability in the palm oil sector (RSPO, n.d.-b). While Unilever does not directly work with RSPO, they both maintain active exchange (P2). According to P2, while "we *(RSPO)* do not engage directly with them *(Unilever)* […], our research outputs inform RSPO strategies, guidance, and tools that members—including Unilever—may use to design and improve their smallholder programs."
- **Collaboration with on-ground organisations, local communities and government, and private companies** – In Indonesia, Unilever provides financial support for on-ground projects, such as forest restoration and protection, and smallholder training (external to Unilever's palm oil value chain) with assistance to obtain palm oil certification (e.g. ISPO, RSPO), among others (Unilever, 2023a). The company also collaborates with private companies, such as technological firms, to improve deforestation monitoring, traceability in the value chain, and research alternative low-emission ingredients (Unilever, 2023a). Although Unilever shared specific objectives for supporting local Indonesian projects, it is unclear whether a change in the company's priorities could affect the implementation of these projects. In 2023, the company aimed to "help protect and regenerate 1.5 million hectares of land, forests and oceans by 2030"(Unilever, 2023b, p. 5), but in 2024, this number went down to 1 million (Unilever, 2025a)

*Other strategies*

**Direct sourcing** – To reduce intermediaries in their palm oil value chain, Unilever is working to increase direct sourcing by directly engaging with farmers, mills and refineries to improve the traceability and transparency of their palm oil value chain. In 2021, Unilever also invested directly in owning palm oil refineries in Indonesia, and is working with mills from their value chain on transforming mills' effluents into biofuel for use in the company's refineries (Unilever, 2023a).

**Purchase of credits to compensate carbon emissions and unsustainable palm oil –** Between October 2023 and September 2024, to reduce their emissions, Unilever purchased internationally recognised carbon credits to compensate for hundreds of tons of CO2e (Unilever, 2024d). The carbon credits were purchased from peatland protection and restoration projects (outside the company's projects), aiming to reduce GHG emissions in Indonesia (Unilever, 2024d). Additionally, the company relies on the purchase of RSPO ISH credits to claim a higher percentage of sustainable palm oil. However, it is unclear how these credits are taken into account in the GHG emissions calculation.

In conclusion, although palm oil accounts for at least 7% of Unilever's total emissions (excluding consumer use), the company does not have a dedicated decarbonisation strategy for its palm oil value chain. However, relevant commitments and actions within its broader emissions reduction plan are applicable. Unilever is committed to reducing their Scope 3 emissions by 39.5%, but they have not set a specific reduction target for emissions linked to their palm oil. Unilever is also committed to sourcing their palm oil from deforestation/conversion-free and sustainable areas, and improving the traceability of their palm oil value chain. To meet with their commitments, Unilever is reducing their overall palm oil consumption, applying palm oil sourcing requirements, engaging with actors both, in and out of the value chain, increasing direct sourcing and purchasing credits to compensate carbon emissions and unsustainable palm oil.

## 4.2. Climate-friendly actions implemented by palm oil smallholder farmers in Indonesia

In Indonesia, independent smallholder farmers are important contributors to the palm oil production, as both interviewees (P1; P2) and reports shared (Solidaridad et al., 2025; Suhada et al., 2018). Mentioned by both interviewees (P1; P2) and reviewed documents, smallholders usually have poor farming practices before receiving any type of training (de Vos et al., 2023; Solidaridad et al., 2025; Suhada et al., 2018). One of the interviewees shared that "smallholders, outside of certification *(e.g. RPSO),* generally have poor agricultural practices" (P2). An example is the conversion of peatland to palm oil plantations. As P1 explained, "there are many districts, many regions that [are] naturally located in the peat area where there are not so many options for the smallholders for them to open the land for crops […] and some areas are actually legal [under the national regulations]" (P1). Several reasons can explain the adoption of poor practices, including, as mentioned in the previous sub-chapter, limited financial resources, level of education, access to better material, infrastructure, access to legal documents, knowledge of less-emitting practices, and awareness of the consequences of high-emitting practices, among others (P1; P2) (de Vos et al., 2023; Suhada et al., 2018). Moreover, researchers and P1 emphasised that smallholder farmers' willingness to adopt better practices or pursue certification also largely depends on the financial benefits they can expect to gain (de Vos et al., 2023).

In regards to the impact of climate change on palm oil, one interviewee mentioned that from their experience, the impact is

> "not that obvious from the perspective of palm oil production because [the] palm oil is a relatively tough crop in facing the climate variability […] compared to the other commodities like coffee. […However], we are observing some kinds of [impact from climate change] […] on palm oil mostly due to the unpredicted operability of weather and climate, which is affecting the cropping patterns of palm oil, which eventually it will, […] reduce [the] productivity, but that's not yet that obvious." (P1)

In contrast, Solidaridad reported that climate change-related extreme weather events frequently impact farmers, causing palm oil production and income losses for farmers (Solidaridad et al.,

2025). In 2015, Unilever also reported consequences of severe weather on palm oil production, such as low yields, lower output, and forest fires located in the company's main palm oil sourcing regions, Sumatra & Kalimantan (Unilever, 2023c).

Due to the lack of evidence on climate-friendly practices implemented by independent smallholders outside requirements from certification bodies, national laws, NGO's and companies' training, the following results present "climate-friendly" practices implemented by smallholders was mainly based on these requirements. At the moment, it was reported that "the number of smallholders included in certified value chains is low" (Solidaridad et al., 2025, p. 21), hence, RSPO practices may not reflect the current climate-friendly practices implemented by most smallholders. Moreover, according to a report from Solidaridad, "as of November 2025, ISPO will be mandatory for all smallholders' (p.32) (Solidaridad et al., 2025). Therefore, it is possible that in the future, more of the ISPO practices may commonly be implemented by smallholder farmers in Indonesia.

*Climate-friendly practices*

**Land use change reduction** – To mitigate emissions from land use change, farming practices include committing to zero deforestation or conversion of land with "high carbon stock", such as forests and peatland, into palm oil plantations as found in RSPO and Unilever requirements and the Indonesian law, which prohibits the burning of land and forests (Resosudarmo et al., 2023; RSPO, 2019; Unilever, 2024c). However, this approach was contested by, P1 who emphasised the importance of working with farmers on increasing plantation productivity, as relying on a legal approach to stop the conversion of forest or peatland has limited effectiveness (P1). Under the RSPO certification, farmers use the High Conversion Value approach, which involves sharing information on their existing palm oil plantation, implementing practices to increase yields (e.g. eliminating competitive plants, removing any obstacles to harvesting), and monitoring and managing plantation expansion (Dr Ata et al., 2024; RSPO, 2019, 2022).. It was also reported that to protect areas, certified RSPO palm oil plantations may also dedicate a part of their land for conservation (Schmidt & De Rosa, 2020). Finally, to reduce palm oil plantation expansion, farmers

work on implementing and maintaining practices that allow them to improve plantations' productivity (P1; P2) (RSPO, 2019; Unilever, 2024c).

**"Climate-friendly" agricultural practices –** Practices to reduce or store carbon emissions include replanting (RSPO, 2019; Solidaridad et al., 2025; Unilever, 2024c). Moreover, farmers commit to not using fire when preparing the land and not using open fire to manage waste (Institute, 2024; RSPO, 2019; Unilever, 2024c). Other practices that help limit GHG emissions include optimising the use of quality fertilisers, using higher-quality seeds, adopting effective harvesting methods and ensuring responsible use of chemicals (P1) (Ernah et al., 2016; RSPO, 2019; Unilever, 2024c). Smallholders already farming on drained peatland can be trained to minimise GHG emissions released even after the peatland has been drained (P1). Unilever also requires farmers to implement practices to avoid wasting energy and reduce GHG-intensive inputs (e.g. fossil fuel) (Unilever, 2024c). Finally, one interviewee mentioned that their organisation is also working with smallholders to implement practices included in the regenerative agriculture (P1). Although described as a relatively new farming approach by the IPCC (2022), P1 commented that" it is not a new thing, in the foundation is the same as what was previously done" (P1). Regenerative agriculture combines practices that aim to restore and protect ecosystems, reduce GHG emissions, and be economically beneficial for farmers, among others (Solidaridad et al., 2025).

*Supporting activities*

**Social and economic empowerment –** Finally, practices that can improve the economic and social conditions of farmers include the sale of RSPO ISH credits at a premium price, although in some conditions, it may not provide much benefit (P1) (RSPO, n.d.-a; Solidaridad et al., 2025; Unilever, 2025a). Some farmers are also practising intercropping by combining palm oil plantation with other crops (e.g. banana) to increase their household income (De Vos et al., 2021; de Vos et al., 2023). Moreover, to reduce reliance on middlemen, some farmers organised into a cooperative have established nurseries to produce their own seeds and support other farmers in accessing higher-quality agricultural inputs (e.g. seedlings) (SPKS, 2021). Finally, under certifications or Unilever's requirements, farmers can benefit from better access to legal documents (e.g. land

certificate), support and farming training (e.g. government support), and the palm oil market, and be more aware of the national regulations and improve the work conditions (P1; P2) (Institute, 2024; RSPO, 2019; Unilever, 2024c).

**Additional "climate-friendly" practices with opportunities for empowering farmers socially and financially –** Besides practices already implemented, many other practices have been identified with the potential to provide higher plantation productivity, reduce GHG emissions and sequester carbon. While many of the practices are already adopted in the coffee and cocoa sector, in the palm oil industry, they are relatively new, as an NGO reported (Solidaridad et al., 2025). Potential practices include:

- **Paludiculture**: This agricultural practice consists of planting adapted plants in peatland to restore drained peatland or use peatland for other productive plantations without draining them (Wetlands International Europe, 2021). According to Dr. Slingerland in Solidaridad et al. (2025), this practice could contribute to reducing GHG emissions and provide alternative incomes to farmers through the culture of "marketable products and carbon credits"(p.27).
- **Agroforestry:** This practice consists of combining intercropping and livestock grazing, which could help reduce their GHG emissions by limiting plantation expansion, increasing plantation outputs, and sequestering carbon, which could potentially lead to receiving additional income through the global carbon markets (Solidaridad et al., 2025).
- **GHG emission calculating tool for smallholders:** Presented by P1, a developing tool adapted to farmers to calculate their own GHG emissions could help improve on-farm GHG emissions calculation, which companies could also benefit from.
- **Climate-smart agricultural (CSA) practices:** Although some practices may already be applied (e.g. organic fertiliser), CSA practices also include crop residue management, recycling biomass waste or conducting land assessment could allow higher productivity, better climate adaptation and GHG mitigation (Solidaridad et al., 2025).
- **Biochar application:** Obtain from biomass (e.g. crop residues, wood), applying biochar to soil can reduce GHG emissions related to biomass decomposition, be an alternative to

chemical fertilisers and participate in carbon sequestration, an opportunity for farmers to be rewarded (IPCC, 2022; Solidaridad et al., 2025).

In conclusion, Indonesian palm oil smallholders are important actors in the palm oil industry but may often rely on unsustainable practices due to limited resources and knowledge. While not necessarily perceived by all small farmers, climate-related impacts on palm oil are emerging due to unpredictable weather threatening yields. Examples of "climate-friendly" practices were identified by mainly examining ISPO and RSPO-certified palm oil farmers, and farmers trained by NGOs or Unilever, due to missing data on farmers with no training. "Climate-friendly" practices to mitigate land use change include the zero-deforestation commitment, increasing yields, monitoring plantation expansion and dedicating land for conservation. To mitigate emissions from poor land management, farmers don't use fire to clear land or manage waste, use higher-quality agricultural inputs (e.g. fertilisers, seeds), adopt better practices (e.g. effective harvesting, responsible use of chemicals, limit GHG from peatland use, regenerative agriculture, avoid wasting energy and reliance on fossil fuels). Additionally, practices that offer opportunities for farmers social and economic empowerment include the sale of RSPO ISH credits, intercropping, and engaging with other groups of farmers and organisations to facilitate access to resources and knowledge. Finally, practices with potential to reduce emissions while offering income opportunities for farmers include paludiculture, agroforestry, a GHG emission calculating tool, CSA practices, biochar application and the global carbon markets.

# 5. Discussion

In this chapter, a comparison of the main findings from the results (Chap 4) with the literature presented in Chap 2. The discussion is organised following the same structure as the results, first a discussion on Unilever's strategy is done, followed by the practices implemented by farmers.

## Unilever's strategy to decarbonise its palm oil value chain

Similar to the findings of CDP (2024), Unilever's scope 3 emissions are the most significant. Also aligned with the results of Schmidt (2015), the most emitting stages of their palm oil value chain are the farming stage, including land use change (e.g. deforestation and peatland conversion) and agricultural practices, and the extracting and refining stages. Although Unilever does not present a separate decarbonisation strategy for their palm oil value chain, commitments and actions present in their broader company's strategy still align with the strategy found from the literature (see Table 1).

Fist, regarding Unilever's commitment, elements found in Unilever's strategy align with the literature. Unilever is committed to reducing their company's emissions; however, the company has emissions reduction targets at the level of the entire company, but none at the palm oil value chain level as suggested by Anderson et al. (2023) and (Acampora et al., 2023). The company is also committed to the "no-deforestation and no-conversion (NDC)" a commitment often cited in the literature, such as Meijaard et al. (2018); Rahman et al. (2025). Yet, depending on the criteria used by Unilever to claim their performance, not all (e.g. RSPO) may align with the definition followed by others. As RSPO (2025) explained, differences exist between the RSPO certification and the EUDR requirements, making the RSPO certification insufficient to claim the "NDC" under the EUDR. Similar to other players in the palm oil industry as mentioned by Schmidt and De Rosa (2020), Unilever, is also committed to sourcing sustainable palm oil. To claim their performance, the company uses the type of certified-RSPO palm and internal criteria; however, they do not all hold the same definition. Hence, using one term to describe products with different definitions could potentially lead to confusion and criticism, as shared by the DCA. For Unilever and other actors in the palm oil sector, as argued by Bakhtary et al. (2020), traceability is a challenge that Unilever is committed to improving.

Unilever implements all the actions mentioned in the literature and presents two additional ones. Similar to other actors in the industry, as shown by Bakhtary et al. (2020) and Bakhtary et al. (2020), Unilever applies sourcing requirements to their suppliers, as many of the palm oil value chain steps remain outside direct control of the company. However, this approach remained criticised. As largely discussed in the literature, with interviewees and other actors in the industry, applying requirements may be more feasible for larger plantations than for smallholder farmers due to their challenging situation. First, sourcing requirements pose a risk of further exclusion of farmers already "left behind" as argued by P1 and Bakhtary et al. (2020). In addition, P1 shares that a lack of awareness about the need for change, combined with the existence of alternative markets to sell products, could further hinder the adoption of new practices. Hence, this practice may also not be effective for companies, as they may also lose suppliers. Unilever also relies on reducing their palm oil consumption to reduce their emissions, a method presented by Lieke et al. (2024), however, the overall impact on emissions reduction remains unclear based on Unilever's available data. Unilever also shows engagement with actors in and out of their value chain to support the value chain compliance with their requirements and external initiatives, similar actions also discussed by Bakhtary et al., 2021; Bakhtary et al., 2020 and Climate Bonds Initiative, 2025. The company engages particularly with smallholders, as it is done in the industry as explained by Schoneveld et al. (2019). Unilever understanding of smallholder farmers situation, aligns with the definition given by Amar et al. (2023) (see in p.6). Moreover, the effectiveness of Unilever's support approach remains uncertain, as key aspects, such as their program's duration and the assurance of positive outcomes after meeting requirements, are unclear. These concerns have been raised by P1, Solidaridad, and the literature by Bakhtary et al., 2021.

In addition to actions identified in the literature, the analysis revealed two additional actions implemented by Unilever. First, the company used "direct sourcing" to be closer to their suppliers to limit intermediaries and improve their palm oil traceability. However, all the specific ways in which direct sourcing is being implemented by Unilever remain unclear, and so does the impact on the involved actors. For example, rather than sourcing only from external Indonesian refineries, Unilever has begun to acquire its own refineries in Indonesia (Unilever, 2023a).

Second, the company relies on purchasing credits to compensate for carbon emissions and unsustainable palm oil practices, not found in the palm oil literature. While the purchase of carbon credits is not uncommon in the broader agri-food industry, as argued by Acampora et al. (2023), the purchase of RSPO-ISH credits to compensate for unsustainable palm oil sourced while supporting ISH is less discussed in the literature. This may be due to the newness of its introduction on the market (in 2019), and the mixed views on the benefits for ISH as P1 and Solidaridad et al. (2025) shared, potentially affecting the availability of these credits on the market.

### Climate-friendly actions implemented by palm oil smallholder farmers in Indonesia

The importance attributed to smallholder farmers in the palm oil production in Indonesia, expressed by interviews and NGOs reports, remains aligned with the literature. As identified by Wreford et al. (2017), Acampora et al. (2023) and Jelsma (2019), economic and social challenges such as limited access to financial, knowledge and infrastructure and so on, remain the main barriers for farmers to adopt new practices, as both interviewees and NGOs reports also mentioned. Regarding the impact of climate change on palm oil production, one interviewee (P1) noted that on-the-ground impacts may not be that obvious yet for smallholder farmers as palm oil trees are much more resistant than other crops (e.g. coffee). This view contrasts with an observation from other actors, such as Solidaridad, which reported frequent climate-related impacts on palm oil production. In the literature, the palm oil production is perceived as under high risk due to the vulnerability of the agriculture sector, smallholders and Indonesia to climate change (European Environment Agency, 2021; Fleming et al., 2019; Qaim et al., 2020; Touch et al., 2024). Regarding the "climate-friendly" practices and supporting activities found in the literature, they align with the practices implemented by palm oil smallholders in Indonesia, with some additions. Due to the lack of primary data on farmers' practices, practices extracted from the document analysis came from "practices" already mentioned in the literature (e.g. RSPO, ISPO), however, by looking inside these certifications or Unilever requirements, specific practices not mentioned in the literature were found.

As a shared requirement for RSPO certification, Unilever and the Indonesian law, to reduce land use change, farmers need to commit to "zero-deforestation and conversion of peatland", a practice by smallholders not directly mentioned in the literature. However, this requirement presents limited effectiveness in the long term, as P1 argued, and so did Bakhtary et al. (2021) in the literature. A more effective practice to limit deforestation and land conversion, as proposed by P1 and present in NGOs, Unilever and certification bodies' trainings, is to improve smallholder productivity. This approach aligns with an observation made by Qaim et al., 2020; Reich & Musshoff, 2025, which explained that small farmers have been more frequently linked to illegal land clearing and forest conversion to compensate for low yields.

Moreover, "climate-friendly" agricultural practices found in the analysis are similar to the ones identified in the literature. The analysis also reveals practices aiming at reducing the impact of emissions from drained peatland (P1). Finally, organisations shared working on the implementation of regenerative agricultural practices, a new concept, according to IPCC (2022), but not so new according to P1.

Regarding supporting activities implemented by farmers to improve their economic and social conditions, the findings from the analysis align with practices found in the literature, while adding a few more. As mentioned earlier, farmers can sell their RSPO-ISH credit and possibly benefit from additional income apart from directly selling their palm oil production. Results also showed that farmers implement intercropping to increase their household income (De Vos et al., 2021; de Vos et al., 2023).

Finally, several additional "climate-friendly" practices with the potential to enhance emissions reduction, while benefiting smallholders, were identified in this study. While many of the practices are already in application in the coffee and cocoa sector, according to Susanti et al. (2020), in the palm oil smallholder practices literature, they are rarely mentioned. These practices include the paludiculture, a GHG emission monitoring tool for smallholders, climate-smart practices (although some practices are already implemented), and agroforestry practices. However, as noted in the literature, the implementation of agroforestry receives divided opinion from the farmers' side, as Susanti et al. (2020) explained.

Since many of the practices discussed were identified through an analysis of farming requirements imposed on smallholders, the long-term adoption of these practices remains very uncertain, a reflection shared by interviewees, NGOs, and the literature. Also, the widespread adoption of these practices remains uncertain, as the portion of smallholder farmers certified by either RSPO or ISPO and verified as “sustainable palm oil” by Unilever is very limited , based on Solidaridad et al. (2025) information.

# 6. Conclusion

## 6.1. Brief recap of the thesis

Omnipresent in food products, cosmetics, cleaning products and in biodiesel production, a daily consumption of palm oil is almost inevitable. In Indonesia, the global "palm oil boom" (Qaim et al., 2020) was seen by the Indonesian government as an opportunity to develop rural regions and reduce poverty; however, the palm oil expansion also came with waves of criticism due to its environmental impact, especially coming from deforestation and peatland conversion (Qaim et al., 2020). Pendrill et al. (2019) demonstrate that deforestation is largely associated with the commodity production, greatly driven by international demand for crops such as palm oil, cocoa and coffee. As a great driver of GHG emissions, the agriculture sector is also one of the most sensitive to climate change (Fleming et al., 2019). In the palm oil sector, smallholder farmers, who produce around 50% of global palm oil, are particularly at risk from climate change due to both the high climate vulnerability of the countries where palm oil is produced and their challenging socio-economic conditions. (European Environment Agency, 2021; Qaim et al., 2020; Touch et al., 2024). These two factors could significantly affect smallholder farmers' yields and overall livelihoods (Touch et al., 2024), with potential rebound effects on agri-food companies and all the actors involved in the palm oil value chain. On the other side, agri-food companies must comply with upcoming regulations and remain aligned with changes in the market demand.

In this context, this study aims to examine the current decarbonisation efforts in the global palm oil value chain and see how these include smallholders. Hence, to conduct this research, the central question is the following:

***What "climate-friendly" practices do smallholder farmers in Indonesia implement to decarbonise their palm oil-related farming activities, and what trade-offs and synergies exist between their practices and Unilever's strategy for decarbonising their palm oil value chain?***

Along with two sub-questions, which are answered in the Results (Chapter 4) and were based on the analysis of interviews and documents.

## 6.2. Answer to RQs

Many opportunities for synergies ("win-win" outcomes) between smallholder farmers' climate-friendly practices and Unilever's palm oil decarbonisation strategy exist, but only under specific conditions. Without adequate and long-term support, these synergies may be at risk and limit progress on both sides.

One practice adopted by some smallholders is the RSPO certification, which allows farmers to access a premium price while contributing to Unilever's decarbonisation commitments, such as sourcing sustainable and deforestation-free palm oil, improving traceability and reducing GHG emissions. However, without external support, acquiring this certification remains a challenge for farmers due to the high costs and required documentation. Hence, through their programme support, Unilever support farmers by offering trainings and resources needed to obtain the certification. However, the uncertainty around the duration of these supporting programmes may impact farmers' ability to remain certified. Indeed, without continued financial assistance, and given the current trend of the market to not be willing to pay for the premium price, many farmers may be unable to afford to stay certified, which could ultimately impact Unilever's ability to meet their goal.

Moreover, as the market for non-certified palm oil remains widely accessible, many farmers may not seek certification and prioritise immediate income if no strong incentives on the sustainable palm oil market are maintained. To ensure long-term engagement, Unilever need to provide long-term support to farmers and use their influence, as a large palm oil consumer, to encourage other actors in the industry to ensure that the market for sustainable palm oil remains present and attractive for farmers.

While some smallholders may already comply with Unilever's zero-deforestation requirement, ensuring lasting change in farming practices requires support for yield improvements. Helping farmers to increase productivity on their existing land may reduce land clearing, but also improve their income.

There is also significant potential in collaborating with actors developing carbon calculator tools for farmers. The adoption of this tool could improve palm oil traceability and data quality of on-farm emissions beneficial for Unilever, while enabling farmers to quantify carbon

sequestration from practices such as intercropping and replanting. This could open an access to the carbon market and create new income opportunities for farmers.

Unilever's purchase of RSPO Independent Smallholder (ISH) credits to compensate for unsustainable sourcing presents another source of income for farmers. However, for this to remain attractive to farmers, the value of credits must remain high enough so that the investment in holding this certification remains beneficial.

Finally, several additional practices offer strong potential for both emissions reduction and increasing farmers' income. Under the right conditions, approaches such as paludiculture, agroforestry, climate-smart agriculture (CSA), biochar application, and emissions monitoring tools for smallholders could significantly increase alignment between Unilever's decarbonisation goals and the economic needs of smallholder farmers.

In conclusion, Indonesian smallholder farmers are already implementing several climate-friendly practices that align with Unilever's decarbonisation strategy. However, the success of these practices depends heavily on long-term support, market incentives, and investment in tools and partnerships.

## 6.3. Reflection on the limitations

This research presents several limitations that may greatly influence the quality and accuracy of its findings.

First, the framework used to analyse Unilever's strategy was created based on a general decarbonisation strategy approach and insights from the literature that could apply to the palm oil industry. Due to time constraints and the vast body of literature on the topic, some "new" findings of this research may already be present in existing studies. Additionally, the lack of direct insights from Unilever limited the ability to fully understand and potentially accurately represent the company's strategy. As a result, the interpretation of the strategy and the use of their data may contain many inaccuracies and misrepresentations.

Similarly, the framework used to examine smallholder farmers' practices was built on general findings from the literature. Given the extensive research already available on smallholders, important elements may be missing or not fully represent the reality. A key

limitation of this research relates to the findings on “climate-friendly” practices implemented by farmers in Indonesia. Due to language barriers and difficult access to direct interaction with farmers, the results relied on limited information from actors working directly and indirectly with farmers. Hence, the specific views of these actors may also misrepresent the reality of the condition and perception of farmers on the ground. Finally, due to limited time to conduct the research, a case study was chosen; hence, the results of the findings may only be true in these specific settings. As Unilever also source their palm oil from many other regions, farmers’ practices, challenges, and opportunities may be different.

## 6.4. Recommendations

There is a need to agree on clear, standardised definitions of “deforestation-free” and “sustainable palm oil” to avoid confusion and the wrong expectations on such claims. Likewise, multiple “best practices” are available, such as those recommended by RSPO, ISPO, NGOs, researchers and companies. Establishing an internationally shared set of Good Agricultural Practices (GAPs) would help to better understand what these practices entail and potentially facilitate their adoption by smallholders, by potentially avoiding constant adjustments to their practices depending on the organisation they work with. Also, creating an equivalence between both national and international sustainable palm oil certifications (ISPO and RSPO) could potentially help farmers adopt both. As the ISPO may soon be mandatory for smallholders in Indonesia, establishing clear steps to further become RSPO-certified could facilitate access for farmers to the international market for sustainable palm oil. Finally, major palm oil-importing countries such as China and India, which have different regulatory requirements, should be encouraged to collaborate internationally to harmonise standards and mitigate palm oil-related emissions globally.

## 6.5. Recommendations for further research

First, to better understand how companies decarbonise their palm oil value chain, the current framework should be adjusted and retested on other companies in the palm oil sector. By doing so, differences and similarities with the developed framework in this study could help more

accurately represent the common strategies used by companies to decarbonise their palm oil value chains. Additionally, a study could expand beyond Indonesian smallholder farmers and examine Malaysia, the second-largest palm oil producer and exporter. Since Unilever also sources from both countries, the same study could be conducted while looking at the two different regions. This could help determine whether the decarbonisation efforts are truly adapted to local contexts or simply replicated across regions. For example, Leegwater et al. (2025), an actor in the palm oil industry based in Malaysia, highlighted a lack of local workers, a challenge not particularly shared by actors in Indonesia. Like Indonesia, Malaysia holds their own national palm oil certification and national law, which could also potentially facilitate or hinder compliance with external requirements (e.g. RSPO, Unilever requirements).

# Bibliography

## Literature review


Abas, A., Er, A. C., Tambi, N., & Yusoff, N. H. (2022). A systematic review on sustainable agricultural practices among oil palm farmers. *Outlook on Agriculture*, *51*(2), 155-163. https://doi.org/10.1177/00307270211021875

Acampora, A., Ruini, L., Mattia, G., Pratesi, C. A., & Lucchetti, M. C. (2023). Towards carbon neutrality in the agri-food sector: Drivers and barriers. *Resources, Conservation & Recycling*, *189*. https://doi.org/10.1016/j.resconrec.2022.106755

Alhaji, A. M., Almeida, E. S., Carneiro, C. R., da Silva, C. A. S., Monteiro, S., & Coimbra, J. S. d. R. (2024). Palm Oil (Elaeis guineensis): A Journey through Sustainability, Processing, and Utilization. *Foods*, *13*(17), 2814. https://doi.org/10.3390/foods13172814

Anderson, C., Bicalho, T., Wallace, E., Letts, T., & Stevenson, M. (2023). Forest, Land and Agriculture Science-Based Target-Setting Guidance. In. Washington, DC.: World Wildlife Fund.

Apriani, E., Kim, Y.-S., Fisher, L. A., & Baral, H. (2020). Non-state certification of smallholders for sustainable palm oil in Sumatra, Indonesia. *Land Use Policy*, *99*, 105112. https://doi.org/https://doi.org/10.1016/j.landusepol.2020.105112

Bakhtary, H., Haupt, F., Luttrell, C., Landholm, D., & Jelsma, I. (2021). *Promoting sustainable oil palm production by independent smallholders in Indonesia: Perspectives from non-state actors*.

Bakhtary, H., Matson, E., Mikulcak, F., Streck, C., & Thomson, A. (2020). *Company Progress in Engaging Smallholders to Implement ZeroDeforestation Commitments in Cocoa and Palm Oil*. https://climatefocus.com/wp-content/uploads/2022/06/20200312-Smallholder-Cocoa-Palm-Report-Edited_FINAL_0.pdf

Bessou, C., Chase, L. D. C., Henson, I. E., Abdul-Manan, A. F. N., Milà i Canals, L., Agus, F., Sharma, M., & Chin, M. (2014). Pilot application of PalmGHG, the Roundtable on Sustainable Palm Oil greenhouse gas calculator for oil palm products. *Journal of Cleaner Production*, *73*, 136-145. https://doi.org/10.1016/j.jclepro.2013.12.008

Cammelbeeck, T. (2025). *Unilever is the king of greenwashing* https://www.consumentenbond.nl/acties-claims/nieuws/2025/greenwashing-unilever

Chrisendo, D., Siregar, H., & Qaim, M. (2022). Oil palm cultivation improves living standards and human capital formation in smallholder farm households. *World Development*, *159*, 106034. https://doi.org/10.1016/j.worlddev.2022.106034

Climate Bonds Initiative. (2025). *Agrifood Transition Plan Assessment Framework*. https://www.climatebonds.net/data-insights/publications/agrifood-transition-plan-assessment-framework

Cohn, A. S., Newton, P., Gil, J. D. B., Kuhl, L., Samberg, L., Ricciardi, V., Manly, J. R., & Northrop, S. (2017). Smallholder Agriculture and Climate Change. *Annual Review of Environment and Resources*, *42*(Volume 42, 2017), 347-375. https://doi.org/https://doi.org/10.1146/annurev-environ-102016-060946

Crutzen, P. J. (2002). Geology of mankind. *Nature*, *415*(6867), 23-23. https://doi.org/10.1038/415023a

European Commission[1]. (n.d.). *Corporate sustainability due diligence*. Retrieved from https://commission.europa.eu/business-economy-euro/doing-business-eu/sustainability-due-diligence-responsible-business/corporate-sustainability-due-diligence_en

European Commission[2]. (n.d.). *Corporate sustainability reporting*. Retrieved from https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

European Commission[3]. (n.d.). *European Climate Law*. Retrieved from https://climate.ec.europa.eu/eu-action/european-climate-law_en#:~:text=Climate%20neutrality%20by%202050%20means,and%20protecting%20the%20natural%20environment.

European Commission[4]. (n.d.). *Regulation on Deforestation-free Products*. Retrieved from https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products_en

European Commission[5]. (n.d.). *The European Green Deal*. Retrieved from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

European Environment Agency. (2021). *Global climate change impacts and the supply of agricultural commodities to Europe* (ISBN: 978-92-9480-319-1). https://www.eea.europa.eu/en/analysis/publications/global-climate-change-impacts-and

European Environment Agency. (n.d.). *life cycle assessment*. Retrieved from https://www.eea.europa.eu/help/glossary/eea-glossary/life-cycle-assessment

FAO. (2018). *Zero-deforestation commitments - A new avenue towards enhanced forest governance?* (Forestry Working Paper No. 3, Issue. R. FAO. https://openknowledge.fao.org/server/api/core/bitstreams/3a81efd9-2f3f-404c-8a6b-6da0ea63ec76/content

FAO. (2022). *Greenhouse gas emissions from agrifood systems: Global, regional and country trends, 2000–2020*. https://openknowledge.fao.org/server/api/core/bitstreams/121cc613-3d0f-431c-b083-cc2031dd8826/content

FAO. (2024). *Greenhouse gas emissions from agrifood systems. Global, regional and country trends, 2000–2022*. Retrieved June 14 from https://www.fao.org/statistics/highlights-archive/highlights-detail/greenhouse-gas-emissions-from-agrifood-systems.-global--regional-and-country-trends--2000-2022/en

Fleming, A., Stitzlein, C., Jakku, E., & Fielke, E. (2019). Missed opportunity? Framing actions around co-benefits for carbon mitigation in Australian agriculture. *Land Use Policy*, *85*, 230-238. https://doi.org/10.1016/j.landusepol.2019.03.050

GHG Protocol. (2011). Corporate Value Chain (Scope 3) Accounting and Reporting Standard: Supplement to the GHG Protocol Corporate Accounting and Reporting Standard. In: World Resources Institute and World Business Council for Sustainable Development.

Institute, E. F. (2024). *ISPO certification for smallholders: process and challenges*. https://efi.int/sites/default/files/files/flegtredd/Terpercaya/Briefings/Overview_ISPO_Certification_smallholders_EN.pdf

IPCC. (2022). *Climate Change 2022: Mitigation of Climate Change*. C. U. Press. https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf

Jawo, T. O., Dennis, K., & and Lojka, B. (2023). The impact of climate change on coffee production of small farmers and their adaptation strategies: a review. *Climate and Development*, *15*(2), 93-109. https://doi.org/10.1080/17565529.2022.2057906

Jelsma, I. (2019). *In search of sustainable and inclusive palm oil production: The role of smallholders in Indonesia* [Dissertation, Utrecht University]. The Netherlands.

Lieke, S.-D., Spiller, A., & Busch, G. (2024). Are consumers still barking up the wrong (palm) tree? Insights into perceptions towards palm oil-related labels and claims. *Food Quality and Preference*, *120*, 105258. https://doi.org/10.1016/j.foodqual.2024.105258

Mbow, C., Rosenzweig, C., Barioni, L. G., Benton, T. G., Herrero, M., Krishnapillai, M., Liwenga, E., Pradhan, P., Rivera-Ferre, M. G., Sapkota, T., Tubiello, F. N., & Xu, Y. (2019). *Chapter 5: Food security* (Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, Issue. https://www.ipcc.ch/site/assets/uploads/sites/4/2022/11/SRCCL_Chapter_5.pdf

Meijaard, E., Garcia-Ulloa, J., Sheil, D., Wich, S. A., Carlson, K. M., Juffe-Bignoli, D., & Brooks, T. M. (2018). *Oil palm and biodiversity: A situation analysis by the IUCN Oil Palm Task Force*. I. U. f. C. o. N. (IUCN).

Mondelez International. (2025). *Snacking Made RIght - Report 2024*. https://www.mondelezinternational.com/assets/Snacking-Made-Right/SMR-Report/2024/2024-MDLZ-Snacking-Made-Right-ESG-Report.pdf

Nestlé. (2025). *Creating Shared Value at Nestlé*. https://www.nestle.com/sites/default/files/2025-02/creating-shared-value-nestle-2024.pdf

Okarda, B., Purnomo, H., Juniyanti, L., Kusumadewi, S. D., & Nadhira, S. (2024). Indonesian palm oil towards sustainability: a system dynamic approach. *IOP Conference Series: Earth and Environmental Science*, *1379*(1), 012037. https://doi.org/10.1088/1755-1315/1379/1/012037

Pendrill, F., Persson, U. M., Godar, J., Kastner, T., Moran, D., Schmidt, S., & Wood, R. (2019). Agricultural and forestry trade drives large share of tropical deforestation emissions. *Global Environmental Change*, *56*, 1-10. https://doi.org/10.1016/j.gloenvcha.2019.03.002

Petri, H., Hendrawan, D., Bähr, T., Musshoff, O., Wollni, M., Asnawi, R., & Faust, H. (2024). Replanting challenges among Indonesian oil palm smallholders: a narrative review. *Environment, Development and Sustainability*, *26*(8), 19351-19367. https://doi.org/10.1007/s10668-023-03527-z

Qaim, M., Sibhatu, K. T., Siregar, H., & Grass, I. (2020). Environmental, Economic, and Social Consequences of the Oil Palm Boom. *Annual Review of Resource Economics*, *12*(Volume 12, 2020), 321-344. https://doi.org/10.1146/annurev-resource-110119-024922

Rahman, M. H., Naito, D., Moeliono, M., Mitani, Y., & Susaeta, A. I. (2025). Oil palm- and rubber-driven deforestation in Indonesia and Malaysia (2000–2021) and efforts toward zero deforestation commitments. *Agroforestry Systems*, *99*(1), 20. https://doi.org/10.1007/s10457-024-01119-y

Ranganathan, J., Corbier, L., Bhatia, L., Schmitz, S., Oren, K., Dawson, B., Spannagle, M., McMahon, M., Boileau, P., Frederick, R., Vanderborght, B., Thomson, F., Woo, C. M., Pankhida, N., Miner, R., Segalen, L., Bhattacharjee, S., Cummis, C., Breidenich, C.,…Cook, E. (2004). WBCSD/WRI, 2004. Greenhouse Gas Protocol: a Corporate Accounting and Reporting Standard. In.

Reich, C., & Musshoff, O. (2025). Oil palm smallholders and the road to certification: Insights from Indonesia. *Journal of Environmental Management*, *375*, 124303. https://doi.org/10.1016/j.jenvman.2025.124303

Saadun, N., Lim, E. A. L., Esa, S. M., Ngu, F., Awang, F., Gimin, A., Johari, I. H., Firdaus, M. A., Wagimin, N. I., & Azhar, B. (2018). Socio-ecological perspectives of engaging smallholders in environmental-friendly palm oil certification schemes. *Land Use Policy*, *72*, 333-340. https://doi.org/https://doi.org/10.1016/j.landusepol.2017.12.057

Santos, N., Monzini Taccone di Sitizano, J., Pedersen, E., & Borgomeo, E. (2022). *Investing in carbon neutrality – Utopia or the new green wave? Challenges and opportunities for agrifood systems.*

Schmidt, J., & De Rosa, M. (2020). Certified palm oil reduces greenhouse gas emissions compared to non-certified. *Journal of Cleaner Production*, *277*, 124045. https://doi.org/https://doi.org/10.1016/j.jclepro.2020.124045

Schmidt, J. H. (2015). Life cycle assessment of five vegetable oils. *Journal of Cleaner Production*, *87*, 130-138. https://doi.org/https://doi.org/10.1016/j.jclepro.2014.10.011

Schoneveld, G. C., van der Haar, S., Ekowati, D., Andrianto, A., Komarudin, H., Okarda, B., Jelsma, I., & Pacheco, P. (2019). Certification, good agricultural practice and smallholder heterogeneity: Differentiated pathways for resolving compliance gaps in the Indonesian oil palm sector. *Global Environmental Change*, *57*, 101933. https://doi.org/10.1016/j.gloenvcha.2019.101933

Scudder, M., Wampe, N., Waviki, Z., Applegate, G., & Herbohn, J. (2022). Smallholder cocoa agroforestry systems; is increased yield worth the labour and capital inputs? *Agricultural Systems*, *196*, 103350. https://doi.org/https://doi.org/10.1016/j.agsy.2021.103350

Siregar, A. A., Halimatussadiah, A., Moeis, F. R., Anky, W. A. K., & Nainggolan, D. (2024). The oil palm replanting imperative: Are smallholder farmers willing to participate? *Forest Policy and Economics*, *169*, 103362. https://doi.org/10.1016/j.forpol.2024.103362

Suardi, T. F., Sulistyowati, L., Noor, T. I., & Setiawan, I. (2022). Analysis of the Sustainability Level of Smallholder Oil Palm Agribusiness in Labuhanbatu Regency, North Sumatra. *Agriculture*, *12*(9), 1469. https://www.mdpi.com/2077-0472/12/9/1469

Suhartini, S., Nur, H., Ainur, R. N., Roshni, P., Beti, P. M., Nurul, U. R., Irnia, N., & and Melville, L. (2022). Sustainable strategies for anaerobic digestion of oil palm empty fruit bunches in Indonesia: a review. *International Journal of Sustainable Energy*, *41*(11), 2044-2096. https://doi.org/10.1080/14786451.2022.2130923

Sundaraja, C. S., Hine, D. W., & Lykins, A. (2020). Confronting the palm oil crisis: Identifying behaviours for targeted interventions. *Environmental Science & Policy*, *103*, 99-106. https://doi.org/10.1016j.envsci.2019.08.004

Susanti, A., Marhaento, H., Permadi, D. B., Hermudananto, Budiadi, Imron, M. A., Maimunah, S., Susanto, D., Bakhtiar, I., & Lembasi, M. (2020). Smallholder farmers' perception on oil palm agroforestry. *IOP Conference Series: Earth and Environmental Science*, *449*(1), 012056. https://doi.org/10.1088/1755-1315/449/1/012056

Tan, S. T., Hashim, H., Abdul Rashid, A. H., Lim, J. S., Ho, W. S., & Jaafar, A. B. (2018). Economic and spatial planning for sustainable oil palm biomass resources to mitigate transboundary haze issue. *Energy*, *146*, 169-178. https://doi.org/10.1016/j.energy.2017.07.080

Touch, V., Tan, D. K. Y., Cook, B. R., Liu, D. L., Cross, R., Tran, T., Utomo, A., Yous, S., Grunbuhel, C., & Cowie, A. (2024). Smallholder farmers' challenges and opportunities: Implications for agricultural production, environment and food security. *Journal of Environmental Management*, *370*. https://doi.org/10.1016/j.jenvman.2024.122536

United Nations. (n.d.). *The Paris Agreement*. Retrieved January 20 from https://unfccc.int/process-and-meetings/the-paris-agreement

van Noordwijk, M., Pacheco, P., Slingerland, M., Dewi, S., & Khasanah, N. (2017). *Palm oil expansion in tropical forest margins or sustainability of production? Focal issues of regulations and private standards.* [Working paper].

## Case study


CDP. (2024). *CDP Technical Note: Relevance of Scope 3 Categories by Sector - CDP Corporate Questionnaire*. https://cdn.cdp.net/cdp-production/cms/guidance_docs/pdfs/000/003/504/original/CDP-technical-note-scope-3-relevance-by-sector.pdf?1649687608

De Vos, R. E., Suwarno, A., Slingerland, M., Van Der Meer, P. J., & Lucey, J. M. (2021). Independent oil palm smallholder management practices and yields: can RSPO certification make a difference? *Environmental Research Letters*, *16*. https://doi.org/10.1088/1748-9326/ac018d

de Vos, R. E., Suwarno, A., Slingerland, M., van der Meer, P. J., & Lucey, J. M. (2023). Pre-certification conditions of independent oil palm smallholders in Indonesia. Assessing prospects for RSPO certification. *Land Use Policy*, *130*, 106660. https://doi.org/https://doi.org/10.1016/j.landusepol.2023.106660

Dr Ata, A., Osman, H. I., Ratnam, M., Ramachandran, V., & Savory, S. I. (2024). *The Road to Certified Sustainable Palm Oil: A Guide to Continuous Improvement and Yield Intensification* (A. S. o. Business, Ed.) https://publuu.com/flip-book/288834/1496305

Ernah, Parvathi, P., & Waibel, H. (2016). Adoption of Sustainable Palm Oil Practices by Indonesian Smallholder Farmers. *Journal of Southeast Asian Economies*, *33*(3), 291-316. http://www.jstor.org/stable/44132408

Foreign Agriculture Service. (2024). *Production - Palm Oil*. Retrieved from https://www.fas.usda.gov/data/production/commodity/4243000

Hasan, F., Ahmad, T., Fahmid, M. M., & Fadhil, I. (2021). *Reducing Poverty, Improving Sustainability: Palm Oil Smallholders are Key to Meeting the UN SDGs*. https://indef.or.id/wp-content/uploads/2023/03/Working-Paper-Reducing-Poverty-Improving-Sustainability-Palm-Oil-Smallholders-are-Key-to-Meeting-the-UN-SDGs.pdf

IPCC. (2022). *Climate Change 2022: Mitigation of Climate Change*. C. U. Press. https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf

Pacheco, P., Gnych, S., Dermawan, A., Komarudin, H., & Okarda, B. (2017). *The palm oil global value chain: Implications for economic growth and social and environmental sustainability*. C. f. I. F. R. (CIFOR).

Resosudarmo, I. A. P., Tacconi, L., & Waluyo, E. A. (2023). Enforcement and compliance with the no-burning policy on villagers in Indonesia. *Forest Policy and Economics*, *151*, 102968. https://doi.org/https://doi.org/10.1016/j.forpol.2023.102968

RSPO. (2019). *RSPO INDEPENDENT SMALLHOLDER STANDARD - For the Production of Sustainable Palm Oil*. https://rspo.org/wp-content/uploads/RSPO_ISH_Standard_2019-English.pdf

RSPO. (2022). *Guidance Document on the Simplified High Conservation Value (HCV) Approach for Smallholders in the RSPO - Introduction Document (Phases 1 and 2)*. https://rspo.org/resources/?category=simplified-hcv-approach-for-smallholder

RSPO. (2025). *RSPO and EUDR*. Retrieved July 14 from https://rspo.org/why-sustainable-palm-oil/eudr/

RSPO. (n.d.-a). *RSPO Supply Chains*. Retrieved June 11 from https://rspo.org/as-an-organisation/certification/supply-chains/

RSPO. (n.d.-b). *Who we are*. Retrieved April 1 from https://rspo.org/who-we-are/

Solidaridad, Oktarina, S. D., Sabar, S., Dr Ir M Lubis, E. S., MSc Amalia, R., MSc Narung, V., Adzmi bin Hassan, T. H., Lias, R., Ningkos, N. R., Mr Cudjoe, F., & Dr. Ir. Slingerland, M. (2025). *PALM OIL BAROMETER 2025 - Procurement for prosperity*. Solidaridad. https://www.solidaridadnetwork.org/publications/palm-oil-barometer-2025/

SPKS. (2021). *Harga CPO Melonjak, Petani Sawit Dikekang Tengkulak*. Retrieved July 22 from https://spks.or.id/news/read/harga-cpo-melonjak-petani-sawit-dikekang-tengkulak

Suhada, T. A., Bagja, B., & Saleh, S. (2018). *Smallholder Farmers Are Key to Making the Palm Oil Industry Sustainable*. WRI. Retrieved July 20 from https://www.wri.org/insights/smallholder-farmers-are-key-making-palm-oil-industry-sustainable

Suharno, I., Dehen, Y. A., & Barbara, B. (2015). *Opportunities for Increasing Productivity & Profitability of Oil Palm Smallholder Farmers in Central Kalimantan*. https://climatepolicyinitiative.org/wp-content/uploads/2015/04/Opportunities-for-Increasing-Productivity-Profitability-of-Oil-Palm-Smallholder-Farmers-in-Central-Kalimantan-Full-Report1.pdf

Unilever. (2016). *Unilever Sustainable Palm Oil Sourcing Policy – 2016*. Retrieved June 1 from https://www.unilever.nl/files/origin/2ad94e043f3a45babdbefe2a1ddb93dae14c770a.pdf/unilever-palm-oil-policy-may-2016_tcm1352-482083_nl.pdf

Unilever. (2020a). *Unilever plc - CDP Climate Change Questionnaire 2020*. https://www.unilever.com/files/origin/d220e868b5c9e3effebdd24f3e372f455ce8dbbe.pdf/Unilever-CDP-Climate-2020.pdf

Unilever. (2020b). *Unilever plc - CDP Forests Questionnaire 2020*. https://www.unilever.com/files/origin/23ea146d0074845bd78d192f0cb689bbbff68210.pdf/unilever-cdp-forests-response-2020.pdf

Unilever. (2021a). *Unilever Annual Report and Accounts 2021*. https://www.unilever.com/files/33321193-0d9a-44dd-93f8-02209fc6bd54/annual-report-and-accounts-2021.pdf

Unilever. (2021b). *Unilever plc - CDP Climate Change Questionnaire 2021*. **https://www.unilever.com/files/d075fa00-5b54-4b00-9642-954662c9d070/unilever-cdp-climate-response.pdf**

Unilever. (2021c). *Unilever plc - CDP Forests Questionnaire 2021*. https://www.unilever.com/files/8193006e-895a-4e90-9ef2-abb0baba615d/unilever-cdp-forests-response.pdf

Unilever. (2022a). *Independent verification protocol for deforestation-free and peat conversion-free palm oil. Guidance for Unilever's palm oil suppliers and verification bodies*. https://www.unilever.com/files/independent-verification-protocol-palm-oil.pdf

Unilever. (2022b). *SAP, Unilever pilot blockchain technology supporting deforestation-free palm oil*. Retrieved June 24 from https://www.unilever.com/news/press-and-media/press-releases/2022/sap-unilever-pilot-blockchain-technology-supporting-deforestationfree-palm-oil/

Unilever. (2022c). *Unilever Annual Report and Accounts 2022* https://www.unilever.com/files/d30d4383-ed4e-4014-9443-ebd2fcfba898/unilever-annual-report-and-accounts-2022.pdf

Unilever. (2022d). *Unilever plc - CDP Climate Change Questionnaire 2022*. https://www.unilever.com/files/3ec447d8-6e68-4b94-8da0-016dc91507ad/cdp-climate-2022.pdf

Unilever. (2022e). *Unilever plc - CDP Forests Questionnaire 2022*. https://www.unilever.com/files/61d6c905-6d9c-4fdc-9a8a-a1320f40ee82/cdp-forests-2022.pdf

Unilever. (2023a). *Reimagining Landscapes - How Unilever is helping to make sustainable living common place in palm oil production landscapes*. https://www.unilever.com/files/cb2e2a9e-2cbf-41f2-9a04-7028ba016e14/m10156-unilever-suso-report.pdf

Unilever. (2023b). *Unilever Annual Report and Accounts 2023*. https://www.unilever.com/files/66bc4aea-608f-46ee-8da3-cde0ec8ebe90/unilever-annual-report-and-accounts-2023.pdfin

Unilever. (2023c). *Unilever plc - CDP Climate Change Questionnaire 2023*. https://www.unilever.com/files/unilever-cdp-climate-change-questionnaire-2023.pdf

Unilever. (2023d). Unilever plc - CDP Forests Questionnaire 2023 https://www.unilever.com/files/cdp-forests-questionnaire-2023.pdf

Unilever. (2024a). *Climate Transition Action Plan*. https://www.unilever.com/files/ctap.pdf

Unilever. (2024b). *Delivering deforestation-free palm oil through transformative technology*. Retrieved July 16 from https://www.unilver.com/news/news-search/2024/delivering-deforestationfree-palm-oil-through-transformative-technology/

Unilever. (2024c). *Sustainable Agricultural Principles*. https://www.unilever.com/files/unilever-sustainable-agricultural-principles-2024.pdf

Unilever. (2024d). *Unilever plc - 2024 CDP Corporate Questionnaire 2024*. https://www.unilever.com/files/cdp-integrated-questionnaire-2024.pdf

Unilever. (2024e). *Unilever's Suspended or No-Buy List of Palm Oil Companies*. Retrieved July 17 from https://www.unilever.com/files/suspended-or-nobuy-list-of-palm-oil-companies.pdf

Unilever. (2025a). *Unilever Annual Report and Accounts 2024*. https://www.unilever.com/files/unilever-annual-report-and-accounts-2024.pdf

Unilever. (2025b). *Unilever Environmental Policy*. Retrieved July 18 from https://www.unilever.com/files/unilever-environmental-policy.pdf

Unilever. (n.d.-a). *Palm Oil Story*. Retrieved June 1 from https://www.unilever.com/sustainability/nature/deforestation-free-supply-chain/palm-oil-story/

Unilever. (n.d.-b). *Sustainable and deforestation-free palm oil*. Retrieved April 1 from https://www.unilever.com/sustainability/nature/sustainable-palm-oil/

Watts, J. D., Pasaribu, K., Irawan, S., Tacconi, L., Martanila, H., Wiratama, C. G. W., Musthofa, F. K., Sugiarto, B. S., & Manvi, U. P. (2021). Challenges faced by smallholders in achieving sustainable palm oil certification in Indonesia. *World Development*, *146*, 105565. https://doi.org/https://doi.org/10.1016/j.worlddev.2021.105565

Wetlands International Europe. (2021). *A definition of paludiculture in the CAP*. Retrieved July 21 from https://europe.wetlands.org/publication/what-does-paludiculture-mean-a-definition/

# Appendices

## Appendix A: Calculation tables

| | | 2019 (report 2020) | 2020 (report 2021) | 2021 (report 2022) | 2022 (report 2023) | 2023 (report 2024) | 2024 (report 2025) |
|---|---|---|---|---|---|---|---|
| | **Unit** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
| **Global production of palm oil** | tons | - | - | - | - | 76,020,000 | 78,950,000 |
| **Company total emissions (including Scope 3 GHG emissions from indirect consumer use)** | tons CO2e | 62,148,448 | 101,430,000 | 121,120,000 | 111,230,000 | 99,950,000 | 105,840,000 |
| **Company total emissions (excluding Scope 3 GHG emissions from indirect consumer use)** | tons CO2e | *#N/A* | 35,670,000 | 33,740,000 | 53,690,000 | 52,880,000 | 54,490,000 |
| Reporting period (GHG emissions calculated for the palm oil) | date | Oct 2018 - Sept 2019 | Oct 2019 - Sept 2020 | Oct 2020 - Sept 2021 | Oct 2021 - Sept 2022 | Oct 2023 - Sept 2024 | Oct 2024 - Sept 2025 |
| **GHG emissions calculated for the palm oil** | tons CO2e | 2,490,179 | 2,480,293 | 3,158,571 | 3,894,606 | 4,145,070 | *#N/A* |
| Reporting period (Total palm oil volume that is produced and/or sourced) | date | Jan 2019 - Dec 2019 | Jan 2020 - Dec 2020 | Jan 2021 - Dec 2021 | Jan 2022 - Dec 2022 | Jan 2023 - Dec 2023 | Jan 2024 - Dec 2024 |
| **Total palm oil volume that is sourced (tons)** | tons | 876,264.00 | 803,602.00 | 902,449.00 | 778,419.00 | 752,689.12 | *#N/A* |
| **% of emissions related to palm oil (1)** | % | 4.01 | 6.95 | 9.36 | 7.25 | 7.84 | *#N/A* |
| **Palm oil carbon footprint** | kg CO2e/kg palm oil | 2.8 | 3.1 | 3.5 | 5.0 | 5.5 | *#N/A* |
| **Palm oil claimed as deforestation-free and conversion-free** | % | *#N/A* | *#N/A* | *#N/A* | 74 | 97.10 | 95.70 |
| **Palm oil claimed as sustainably sourced** | % | 95.08 | 99.60 | 90 | 94 | 86 | 82 |
| **Unilever usage of palm oil based on global production** | % | | | | | **1.0** | |
| **Scope 3 forest, land and agriculture (FLAG) GHG emissions** | tons CO2e | | | 8400000 | | | 7200000 |

(1) % = GHG emissions calculated for this commodity / Company total emissions (excluding Scope 3 GHG emissions from indirect consumer use)

(2) kg CO2e/kg palm oil = GHG emissions calculated for the palm oil / Total palm oil volume that is produced and/or sourced

**Data from 2023-2024**

| Country | % | Metric tons |
|---|---|---|
| Brazil | 1.10 | 8271.31 |
| Colombia | 3.08 | 23159.67 |
| Costa Rica | 0.44 | 3308.52 |
| Côte d'Ivoire | 2.20 | 16542.62 |
| Ghana | 0.22 | 1654.26 |
| Guatemala | 2.42 | 18196.88 |
| Honduras | 0.44 | 3308.52 |
| India | 0.22 | 1654.26 |
| **Indonesia** | **63.08** | **474773.14** |
| Liberia | 0.22 | 1654.26 |
| **Malaysia** | **21.98** | **165426.18** |
| Nigeria | 0.22 | 1654.26 |
| Panama | 0.22 | 1654.26 |
| Papua New Guinea | 3.08 | 23159.67 |
| Sierra Leone | 0.22 | 1654.26 |
| Solomon Islands | 0.22 | 1654.26 |
| Thailand | 0.66 | 4962.79 |
| **Total** | **100** | **752689.12** |

**Source:** Unilever. (2024b). Unilever plc - 2024 CDP Corporate Questionnaire 2024. https://www.unilever.com/files/cdp-integrated-

| 2024 - Emissions inventory (data) | |
|---|---|
| | Value (tons CO2e) |
| **Total Scope 1 and 2 GHG emissions (market-based)** | 690000 |
| Gross Scope 1 GHG | 480000 |
| Gross market-based Scope 2 GHG emissions( | 210000 |
| Gross location-based Scope 2 GHG emissions(b | 1260000 |
| **Scope 3 GHG emissions in scope of our net zero ambition(c)(d)** | 53800000 |
| **Purchased goods and services** | 41790000 |
| Raw materials and ingredients | 26880000 |
| Packaging materials | 6370000 |
| Indirect procurement | 8540000 |
| **Upstream transportation and distribution (logistics)** | 1610000 |
| **Downstream leased assets (ice cream cabinets)** | 2790000 |
| **Use of sold products (HFC propellants)** | 1600000 |
| **End of life treatment of sold products** | 3700000 |
| **Others** | 2310000 |
| **Total Scope 1, 2 and 3 GHG emissions in scope of net zero ambition (market-based)** | 54490000 |
| Scope 3 GHG emissions – indirect consumer use | 51350000 |
| **Total Scope 1, 2 and 3 GHG emissions (market-based)** | 105840000 |
| **Total Scope 1, 2 and 3 GHG emissions (location-based)** | 106890000 |

Source:Unilever. (2025). Unilever Annual Report and Accounts 2024. https://www.unilever.com/files/unilever-annual-report-and-accounts-2024.pdf

**Data extracted**

| | Unit | Value |
|---|---|---|
| Scope 3 - Upstream activities (total emissions) (tons CO2e) | tons of CO2e | 43400000 |
| **Ratio of emissions of Scope 3 (upstream activities) on the company total emissions (excluding Scope 3 GHG emissions from indirect consumer use)** | % | **81** |
| **Ratio of raw materials and ingredients on emissions of Scope 3 (upstream activities)** | % | **62** |
| Ratio of raw materials and ingredients on company total emissions (excluding Scope 3 GHG emissions from indirect consumer use) | % | **49** |

Source:Unilever. (2025). Unilever Annual Report and Accounts 2024. https://www.unilever.com/files/unilever-annual-report-and-accounts-2024.pdf

## Appendix B: Coding books

### Unilever's decarbonisation strategy

| Category | Sub-category |
|---|---|
| **Commitment** | GHG emissions reduction |
| | No deforestation, No peat conversion |
| | Sustainable palm oil sourcing |
| | Complete traceability |
| **Action** | Supplier sourcing requirements |
| | Palm oil reliance reduction |
| | Value chain engagement |

### "Climate-friendly" practices implemented by Indonesian smallholder farmers

| Category | Sub-categories |
|---|---|
| **"Climate-friendly" practices** | Land use change reduction |
| | "Climate-friendly" agricultural practices |
| **Supporting activities** | Social and economic empowerment |

## Declaration of Originality Master's thesis

By signing this statement, I hereby acknowledge the submitted thesis (hereafter mentioned as "product"), titled:

Involving Smallholder Farmers in Decarbonisation Strategy of the Agri-Food Industry:

**A Case Study of Unilever's Decarbonisation Strategy for Palm Oil Production in Indonesia**

to be produced independently by me, without external help.

Wherever I paraphrase or cite literally, a reference to the original source (journal, book, report, internet, etc.) is given.

By signing this statement, I explicitly declare that I am aware of the fraud sanctions as stated in the Education and Examination Regulations (EERs) of the SBE.

**Place**: Maastricht, The Netherlands

**Date**: July 24, 2025

**First and last name**: Eloïse Jammes

**Study programme**: MSc. Sustainability Science, Policy and Society

**Course/skill**: Master Thesis (2024-2025-003-SSP3021)

**ID number**: 6399056

**Signature**:

## Sustainable Development Goals (SDG) Statement

| | |
|---|---|
| **Name** | Eloise Jammes |
| **ID** | 6399056 |
| **Supervisor** | Dr. Ron Cörvers |
| **Date** | July 24, 2025 |

Through the research conducted for this master's thesis, I seek to contribute to one or more of the 17 SDG(s) set forth by the United Nations (https://www.undp.org/sustainable-development-goals). Specifically:


**SDG Code(s):** SDG 12 and SDG 13

**Explanation (max. 300 words):** With this master's thesis, I seek to contribute to SDG 12 and SDG 13. Exploring what smallholder palm oil farmers are doing to decarbonise their farming practices can help identify opportunities to move towards less emitting practices and progress towards sustainable palm oil production. Indeed, as smallholders play an important role in the agriculture sector, it is crucial to examine their implemented practices and support them in implementing better ones. Also, uncovering what decarbonisation strategy companies are implementing to reduce GHG emissions in the palm oil value chain also allows us to understand the current trend on the market and identify opportunities to promote sustainable consumption and production

across the palm oil value chain. Agri-food companies play a key role in the decarbonisation of the palm oil industry, as they involve and affect multiple actors across the world. Finally, evaluating “win-win” and “win-lose” between top-down strategies and bottom practices can help identify aligned (synergy) situations to maintain or/ amplify, and identify areas for improvements, hence accelerating change in the switch from high-emitting practices to sustainable ones.

## Statement on the use of Generative AI (GenAI) in the master thesis

I hereby certify that I adhered to the SBE guidelines on the use of GenAI tools such as ChatGPT in the master's thesis. In the box below, I document how and for what purposes I used GenAI.

During the preparation of this work, I used GenAI for the following purposes:

- **Text summarizer**: [NotebookLM; this tool was used on few occasions to summarise long papers and extract the relevant information]
- **Explanation provider**: [ChatGPT; this tool was used to explain in other words and simpler words concept not well understood]
- **Language assistant**: [ChatGPT, Grammarly; these tools were used to correct any grammar, punctuation and orthography mistakes, help rephrasing ideas and brainstorm ideas]
- **Translator**: [Google translate, ChatGPT; these tools were used to translate documents from Indonesian and Dutch to English or French]

After using any tool, I reviewed, quality-checked, and edited the content as needed and take full responsibility for the content of the thesis.

By signing this statement, I explicitly declare that I am aware of the fraud sanctions as stated in the Education and Examination Regulations (EERs) of the SBE.

**Place:** Maastricht, The Netherlands

**Date**: July 24, 2025

**First and last name**: Eloïse Jammes

**Study programme**: MSc. Sustainability Science, Policy and Society

**Course/skill**: Master Thesis (2024-2025-003-SSP3021)

**ID number**: i6399056

**Signature**: