



Towards Sustainable Supply Chains – Potential Impacts of Chocolate Companies' CO₂ Cocoa Emission Reduction Strategies on Smallholder Farmers in the Global South

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Abstract

This master thesis investigates the deployment and impact of cocoa supply chain emission reduction strategies implemented by chocolate manufacturers to combat climate change and its effects on smallholder farmers. Through document analysis, expert interviews, and a case study, the study identified possible mitigation strategies in complex cocoa supply chains while determining the implications of emission reduction initiatives on the supply chain and their impacts on smallholder farmers' livelihoods. The literature review contextualizes the research, exploring supply chain management and governance theories and identifying potential emission reduction strategies, including forest protection, conservation, restoration, agroforestry, and improved agricultural practices.

The document analysis revealed that chocolate firms are implementing various strategies, while the potential of agroforestry is highlighted as it can benefit manufacturers and smallholders. Moreover, the study found that chocolate manufacturers are adopting strategies from supply chain management and governance to promote climate mitigation. Findings indicated that climate mitigation strategies can positively affect smallholder livelihoods, enabling income diversification through participation in the voluntary carbon markets and alternative crop cultivation. Industry collaboration emerges as a critical success factor for the implementation and positive effects of those strategies. Landscape approaches were identified as vital for the effective deployment of emissions reduction in the intricate cocoa supply chain, while actions within the own supply chain should not be neglected.

The thesis contributes valuable insights to the field of sustainable supply chain management and sustainability science. It explains emission reduction strategy deployment and potential impacts on smallholder farmers' livelihoods. The conceptual framework developed in the study bridges vertical supply chain strategies with the horizontal sustainable livelihoods approach, providing a comprehensive lens to evaluate the effects of these strategies on cocoa farmers' livelihoods.

Keywords: Smallholder Farmers; Cocoa Supply Chain; CO₂ Emissions; Climate Mitigation; Sustainable Livelihoods

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List of Abbreviations

CFI	Cocoa and Forest Initiative
CSRD	Corporate Sustainability Reporting Directive
CO ₂ eq.	CO ₂ equivalent
EU	European Union
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
LUC	Land Use Change
NGO	Non-governmental Organisation
PES	Payment for Ecosystem Services
SBTi	Science Based Target initiative
SCG	Supply Chain Governance
SCT	Supply Chain Transparency
SCM	Supply Chain Management
SSCM	Sustainable Supply Chain Management
WCF	World Cocoa Foundation

1. Introduction

1.1 Background

Anthropogenic greenhouse gas (GHG) emissions are the primary reason for the current global warming (IPCC, 2022). Various stakeholders are pressuring governments and companies to tackle the problem of global warming as exceeding 1.5°C could already trigger climate tipping points with severe consequences (Armstrong McKay et al., 2022). Action would be needed to limit the breach of planetary boundaries (Rockström et al., 2009). Thus urgent climate action is needed, as consequences can be witnessed across the globe in the form of severe droughts and strengthening weather extremes, which have already led to irreversible impacts (IPCC, 2022). Businesses are one major stakeholder group that can implement climate mitigation strategies. Climate change mitigation strategies of businesses are increasingly important as companies are held accountable for their negative environmental impacts by media, the public and governments. Impact measurement and reporting of environmental and social impacts are put in the focus to enable accountability. The European Union is transforming the corporate sustainability reporting landscape within Europe by deploying the Corporate Sustainability Reporting Directive (CSRD) in 2022, extending the scope of companies that have to report on sustainability issues with the long-term goal of making sustainability reporting as important as financial reporting (Baumüller & Grbenic, 2021). The EU directive includes the mandatory reporting of significant Scope 3 Emissions (Directive 2022/2464). As Scope 3 emissions refer to indirect CO₂ emitted by upstream and downstream activities and are the largest emission share across all industries, pressure builds from investors to change a company's operations towards a more sustainable value chain (Ducoulombier, 2021; World Resource Institute & World Business Council for Sustainable Development, 2011).

This underlines that reducing CO₂ emissions, particularly Scope 3 emissions, is highly important due to the possible severe consequences of climate change through anthropogenic emissions (IPCC, 2022). Agricultural companies are affected by the additional reporting standards and consequences of climate change while also being a significant source of greenhouse gases (Ariom et al., 2022). For instance, cocoa, palm oil and coffee are forest-risk commodities as they drive deforestation, negatively affecting the climate (Grabs & Carodenuto, 2021). Moreover, Afriyie-Kraft et al. (2020) found that 25% of Ghanaian cocoa farmers have not implemented climate adaptation strategies, while 90% are affected negatively by climate change. Schroth et al. (2016) found that if no adaptation measures are taken, large parts of West Africa might already be unsuitable for growing cocoa in 2050. Around 70% of cocoa is sourced in this region (Beg et al., 2017; Schroth et al., 2017). Global chocolate manufacturers might be incentivised in developing and implementing emission reduction and climate change mitigation strategies across their value chain. Nevertheless, the traceability of cocoa is difficult as chocolate value chains are fragmented and complex (Grabs & Carodenuto, 2021).

Importance of supply chain management and governance in the chocolate industry

The complexity leads to challenges in implementing Scope 3 upstream emission reduction strategies, such as increased costs of tracing the cocoa beans to their origin (Fountain & Hütz-Adams, 2022). Moreover, improving sustainability is challenging due to missing influence on sub-suppliers requiring supply chain governance and management measures to be able to act (Keller et al., 2022). Thus, effective supply chain management is essential when working with forest-risk commodities. Fragmented supply chains pose challenges in terms of sustainable supply chain management and governance due to limited Supply Chain Transparency (SCT), which serves as an "indicator for quality, availability, accuracy, accessibility and actuality of supply chain data" (Bastian & Zentes, 2013, p. 554).

Significance of smallholder farmers in the Global South within chocolate production

Smallholder farmers produce ca. 80% of cocoa and are thereby key actors in the chocolate supply chain (Camargo & Nhantumbo, 2016). The commodity is mainly produced in the Global South, as seen in Figure 1 (Fountain & Hütz-Adams, 2022). Smallholders face environmental, social and economic problems by, for instance, being impacted by climate change, obtaining low levels of education and being caught in a poverty trap (Camargo & Nhantumbo, 2016; Fountain & Hütz-Adams, 2022; Stanbury, 2020). Due to their high vulnerability, but high importance, cocoa farmers should be part of the climate mitigation strategies of chocolate companies through actions within the supply chain (Camargo & Nhantumbo, 2016). Strategies should consider the impact on cocoa farmers' livelihoods to ensure that these can be improved while reducing emissions. Moreover, a dependency exists between chocolate businesses and the natural environment, which requires the internalisation of externalities by addressing environmental management through a strategic approach (Camargo & Nhantumbo, 2016).

Production / Imports

Cocoa production in 1,000 tonnes 2020/21 (forecast)

Domestic imports of cocoa in 1,000 tonnes 2020/21

Source: ICCO 2022, Table 3,9

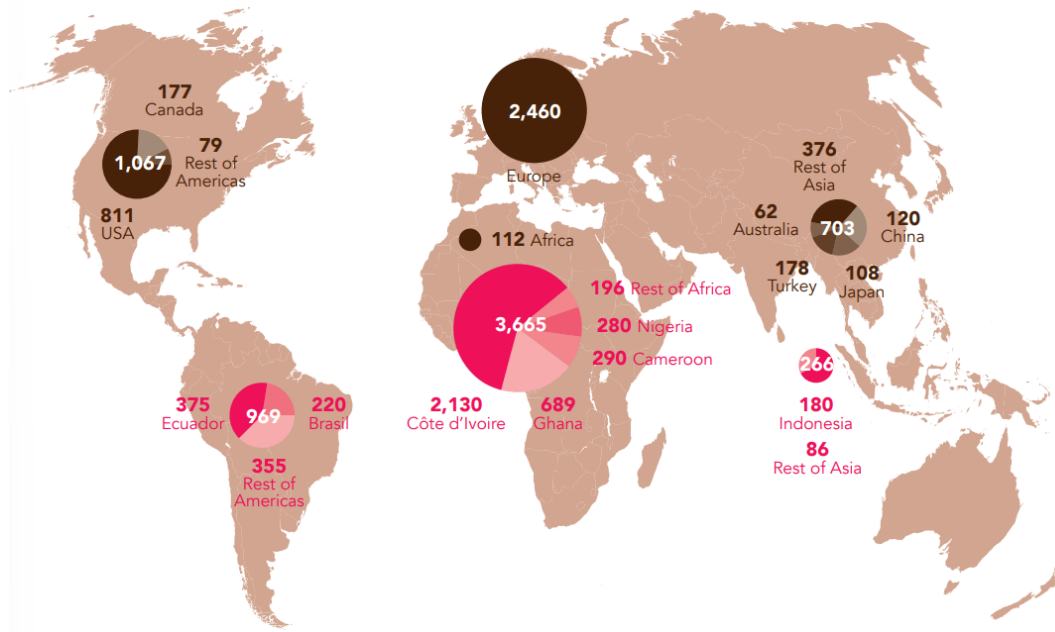


Figure 1: Production/Imports of Cocoa in 2020/21 adopted from the Cocoa Barometer by Fountain and Hütz-Adams (2022), p.76

Due to the external pressures described before, companies can now be held accountable for their supply chain due to mandatory reporting practices. As a result, chocolate manufacturers are deploying strategies to reduce their carbon footprint in the supply chain, which might impact the livelihoods of smallholders in the Global South. Nevertheless, the impact of companies' Scope 3 reduction strategies on smallholder farmers in the Global South is unclear, also due to a lack of overview on the strategies deployed. Thus, the proposed research aims to contribute to understanding supply chain management in the agri-food industry, focusing on exploring emission reduction strategies within cocoa supply chains of chocolate manufacturers in the Global North and their effect on the upstream supply chain and smallholder farmer livelihood. Moreover, the research aims to investigate what strategies are being deployed and to assess possible impacts on the cocoa supply chain and cocoa smallholder farmers as the most vulnerable group in the supply chain. To fulfil those aims, the objective of identifying the strategies adopted by chocolate companies to reduce emissions and assessing the implications of these strategies on the cocoa supply chain, focusing on the situation of smallholder cocoa farmers in the Global South were identified.

1.2 Research Questions

Following the aims and objectives in the first chapter, relevant research questions were developed. The main research question is threefold, including the three topics of Scope 3 emissions reduction strategies, supply chain management, and the impact on smallholders:

How does the implementation of Scope-3 emissions reduction strategies by chocolate companies change the way they manage their cocoa supply chains, and what impact could this have on smallholder cocoa farmers' livelihoods in the Global South?

Three sub-questions were developed to help answer the main research questions:

1. What strategies are chocolate companies deploying to address Scope 3 emissions in their cocoa supply chains?
2. What do these strategies imply for the cocoa supply chain and smallholder cocoa farmers in the Global South?
3. What are the possible impacts of these strategies on the livelihoods of smallholder farmers in the Global South?

1.3 Thesis Outline

The thesis consists of multiple chapters. Chapter 2 will introduce relevant literature and provide a theoretical background on the chocolate supply chain, smallholders' vulnerability, Scope 3 emissions and company strategies. The literature will include a conceptual framework that serves as a lens for analysis in a later stage. Chapter 3 discusses the research design and methodology to answer the research questions and the limitations of the methodology. Chapter 4 will provide the research results while introducing a case study for further information. Within Chapter 5, the results will be discussed, touching upon the framework and literature. The final chapter will discuss the research's conclusions, recommendations, and limitations.

2. Theoretical Background

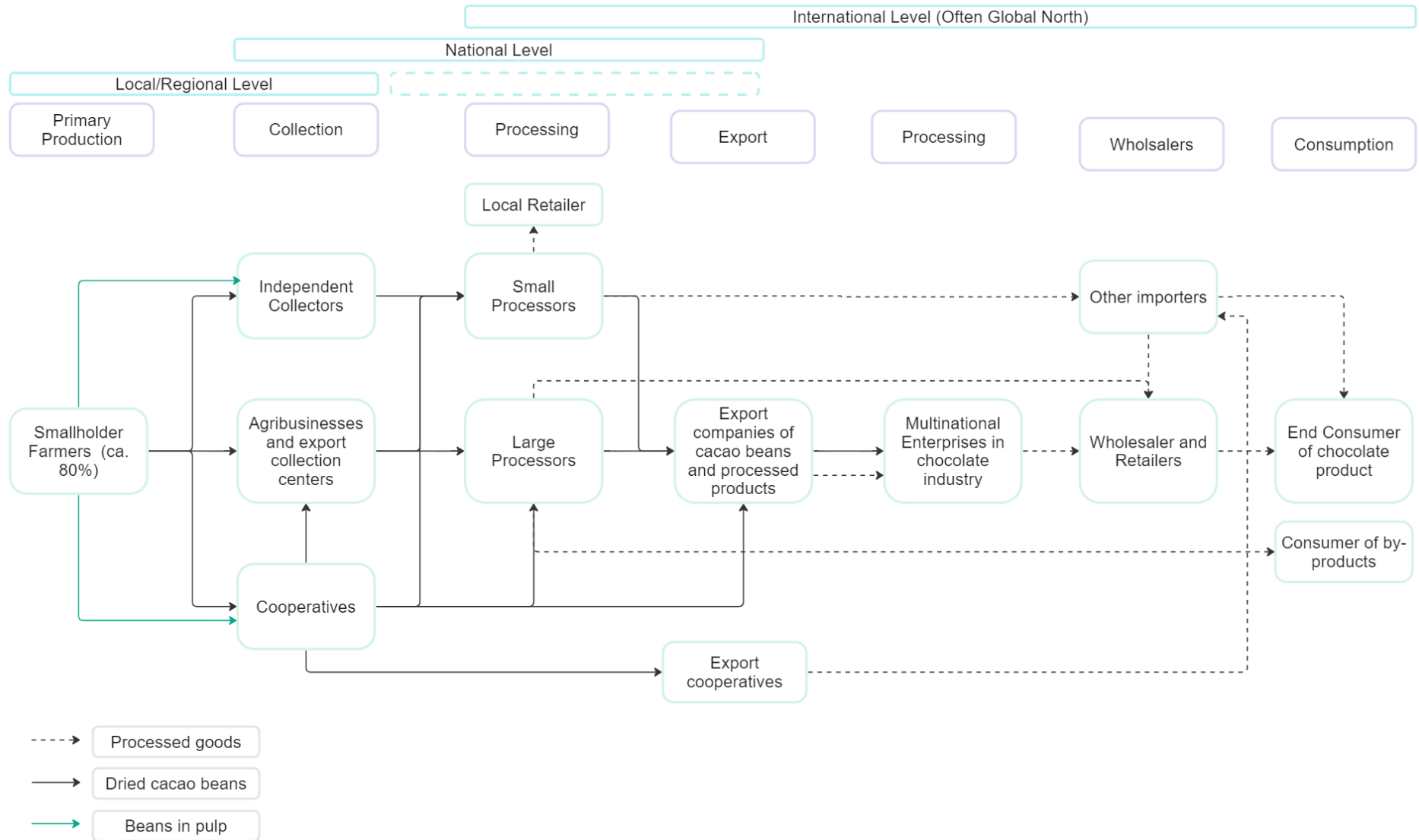
In the following, theoretical background on the chocolate supply chain, supply chain management, Scope 3 emissions, smallholder farmers, and Scope 3 climate mitigation strategies will be provided as a basis for further analysis.

2.1 Background on Chocolate Supply Chain

Each step of chocolate production greatly impacts the final product's quality (Gutiérrez, 2017). Figure 2 simplifies the steps involved from *Theobroma cacao L.* (cocoa) cultivation to the final chocolate product, including the main actors (Gutiérrez, 2017; Stanbury, 2020). The process begins in tropical regions, especially West Africa, with the cultivation of the cacao tree. Approximately 70% of the global cacao was exported from West Africa between 2007 and 2017 (Beg et al., 2017; Schroth et al., 2016). Around 80% of the cacao is cultivated by approximately 5-7 million smallholder farmers (Beg et al., 2017; Camargo & Nhantumbo, 2016; Fountain & Hütz-Adams, 2022; Mohammed et al., 2012). After the cultivation, fermentation and drying process by the smallholders, the cacao beans are ground before being transformed into cocoa liquor, which is then converted into cocoa powder or butter (Gutiérrez, 2017). The butter is used for chocolate manufacturing. A small amount of cocoa is processed within the cultivating countries in the Global South, while a majority is exported in raw bean form after drying, as the chocolate manufacturing industry is mainly located in the Global North. The exporting process involves multiple actors, which makes it difficult to track the origin of the cocoa (Beg et al., 2017; Grabs & Carodenuto, 2021; Mohammed et al., 2012; Renier et al., 2023). Cocoa grinders often fulfil a dual role within the supply chain, as the companies process cocoa beans while also selling the processed goods to chocolate firms for confectionary manufacturing (Staritz et al., 2022).

Sourcing of cacao for chocolate manufacturers, according to Renier et al. (2023), can be categorized into three types: "direct" sourcing, "indirect" sourcing by trading companies from intermediaries, and "unknown" sourcing without supply chain data disclosure. "Direct sourcing" practices do not necessarily mean that the cacao can be traced back to the farm level but to the first buyer only, which often is a farmers' cooperative (Renier et al., 2023). In addition to the actors depicted in Figure 2, stakeholders within the chocolate supply chain include, among others, NGOs, seed producers, competitors, packaging companies, distributors and transport companies, lobby groups, importing and exporting country governments, investors and suppliers of other products and machinery (Camargo & Nhantumbo, 2016; Stanbury, 2020). The main actors in the cocoa market are six big chocolate companies, including Mars, Mondelez, Nestlé, Ferrero, Hershey and Lindt & Sprüngli, purchasing 65% of cocoa and four grinder-traders, Barry Callebaut, Cargill, Olam and ECOM, responsible for 75% of worldwide cocoa processing and trading in 2016 to 2017, while the New York and London cocoa derivate markets set an international price reference for the commodity (Staritz et al., 2022).

Figure 2: Simplified Chocolate Supply Chain derived from Ivanova et al. (2020), Camargo and Nhantumbo (2016), Gutiérrez (2017), and Stanbury (2020);



2.2 The Role of Supply Chain Management and Governance in the Cocoa Industry

Supply chain management (SCM) involves managing material, information and capital flows concerning the production, procurement and distribution of products effectively and efficiently to ensure short and long-term profitability, competitiveness and resilience (Dubey et al., 2017). The inclusion of not only direct suppliers but also sub-suppliers can lead to additional complexity in managing supply chains. While reaching sub-suppliers is more complex than direct suppliers, management methods for both are *supplier assessment* through certification, supplier evaluation and selection, supplier monitoring and auditing programs, and *supplier collaboration* through training and workshops, which usually occurs when a deficiency is detected (Grimm et al., 2016; Jia et al., 2018). SCM literature in the past often ignored the potential risks of the unavailability of natural resources (Matopoulos et al., 2015). Nevertheless, due to the challenges associated with sustainable development, the concept of Sustainable Supply Chain Management (SSCM) has increased in importance (Seuring & Müller, 2008). SSCM is the "integration of social, economic, and environmental considerations with the key inter-organisational business systems to create a coordinated supply chain" (Dubey et al., 2017, p. 1120). Thus, SSCM is considering the whole Triple Bottom Line (Elkington, 1994), which is based on Freeman's stakeholder theory, focusing on value creation for all stakeholder groups by balancing their interests instead of solely the financial bottom line (Freeman, 2010; Van Marrewijk, 2003). Moreover, adopting SSCM can provide economic and environmental benefits and increase the company's reputation (Jia et al., 2018).

While SCM refers to active management of supply chain activities (Chopra & Meindl, 2014), Supply Chain Governance (SCG) highlights the whole systems of relationships within the supply chain, including various forms of interactions that go beyond contractual agreements while aiming to influence other actors in the supply chain to coordinate activities and resolve issues (Hammervoll, 2011). SCG can help to counteract factors like limited transparency and missing standards in complex supply chains (Keller et al., 2022). Governance mechanisms can be *formal*, through contracts and standards, or *informal*, through social norms and values, such as open communication (Koberg & Longoni, 2019). Contracts, certification schemes and knowledge dissemination are three governance mechanisms that stand out positively when improving sustainability in supply chains (Keller et al., 2022). Supply chain standards can benefit cocoa smallholders through higher productivity, higher cacao prices or support in financial opportunities (Fountain & Hütz-Adams, 2022). Nevertheless, due to its potential ethical implications, Fransen et al. (2019) question the inclusivity of business-driven standards as a form of corporate sustainability relationship governance.

Within supply chains, governance mechanisms, such as multi-stakeholder initiatives led by a chocolate company, are often not fixed, and adaptations might be required to ensure effectiveness, such as embedding formal mechanisms for improving coordination within the network (Alvarez et al., 2010). Moreover, the effectiveness of different measures varies within the supply chain, increasing difficulty in choosing and implementing the most promising actions. For instance, for the raw material production of cacao, a mix of formal and informal agreements is recommended to ensure adherence to sustainability standards, while close communication will form a mutual trust that might increase efficiency and profitability (Keller et al., 2022). Similar to SCM, approaches to SCG include supplier collaboration initiatives or development possibilities. These aim to improve supplier performance while being most effective when third parties participate in the collaboration by acting as drivers, facilitators and inspectors (Liu et al., 2018).

Traceability and transparency are required to ensure a sustainable supply chain (Corallo et al., 2020). *Supply Chain Transparency (SCT)* is essential in fragmented agri-food supply chains, and disintermediation, choice of country, formalization of rules, third-party integration in governance and increased supply chain communication can affect SCT positively. SCT will increase social, ecological and operational performance while building long-term supplier relations as key to the success of Western agri-food supply chains (Bastian & Zentes, 2013). In addition, legal drivers put pressure on European firms to implement supply chain transparency. The adopted EU regulation on deforestation-free products includes a ban on imports of the forest-risk commodities cocoa, cattle, coffee, palm oil, soya and wood while requiring information that the goods were not linked to deforestation through a "due-diligence" statement of the supplier (European Parliament, 2023; Zhunusova et al., 2022).

Nevertheless, achieving those criteria in a global supply chain operating in the Global South, such as cocoa, is difficult due to high fragmentation, intercultural differences, low trust, and limited knowledge of the origin of the product (Fountain & Hütz-Adams, 2022; Glavee-Geo et al., 2020; Grabs & Carodenuto, 2021). The provision of this information requires additional transparency and traceability. Overall, effective supply chain management and governance are crucial within the context of sustainable cocoa production due to the fragmented and complex supply chain to ensure long-term profitability and competitiveness (Dubey et al., 2017; Grabs & Carodenuto, 2021).

2.3 Smallholder Farmers and Vulnerability

Smallholder farmers are considered the most vulnerable actors within the chocolate supply chain (Camargo & Nhantumbo, 2016; Stanbury, 2020), so actions should consider the impact on those farmers. Although they often grow other crops, they face various problems, categorized into economic, environmental and social issues, which are strongly interlinked (Stanbury, 2020). Chambers and Conway (1992) introduced the Sustainable Livelihood Approach (SLA) to provide a framework for livelihood analysis for small-farming livelihoods systems by including capability, equity and sustainability in one concept. This framework provides factors that can enhance or reduce livelihoods in relation to each other. SLA includes natural, human, economic, social and physical capital (Table 1) while acknowledging the vulnerability of the livelihoods through shocks.

Table 1: Five Capitals in SLA (Busquet et al., 2021; Morse & McNamara, 2013; Scoones, 1998)

Capital	Description
Natural capital	Natural resource stocks such as soil, water and air; Environmental services, such as hydrological cycle and pollution sinks
Human capital	Skills, knowledge, and labour (including health and physical capability)
Economic capital	Capital base essential for livelihood strategies, such as cash, credit/debt, savings, and other economic assets
Social capital	Social resources (networks, social claims, social relations, affiliations, associations) upon which people draw when pursuing different livelihood strategies requiring coordinated actions
Physical capital	Infrastructure, such as roads and production equipment

The capitals interact with each other to ensure the livelihood of smallholders, while farmers' livelihood strategies are agricultural intensification or extensification, livelihood diversification or migration. These livelihood strategies can reduce poverty, improve farmer well-being, enhance livelihood adaptation and resilience, reduce vulnerability, and ensure a sustainable natural resource base (Scoones, 2009).

Farmers in the Global South face severe problems affecting their livelihood. Farmers earn around 3.5% to 6.4% of the sales price of a chocolate bar (Beg et al., 2017). Although living income has seen positive developments recently, many farmers earn below the living wage (Fountain & Hütz-Adams, 2022; van Vliet et al., 2021). Despite the possibility of a positive feedback loop between household income, input and cocoa yield, a negative impact on one of those factors can also lead to a negative spiral or poverty trap (van Vliet et al., 2021).

Moreover, the smallholders' poverty and financial reliance on cocoa can lead to further deforestation, child labour, and gender inequality (Fountain & Hütz-Adams, 2022).

Approximately 40 to 50 million people depend on cocoa farming as an income source (Beg et al., 2017), which, besides low cocoa prices and yields and limited other income sources, can amplify the poverty traps for indigent farmers (van Vliet et al., 2021). Moreover, possible cocoa price market shocks make those households particularly vulnerable (Busquet et al., 2021). Furthermore, access to finance and infrastructure is limited (Fountain & Hütz-Adams, 2022; Schulte et al., 2020). These economic problems are highly interlinked with social challenges, including breaches of human rights, the lack of education and healthcare, child labour, human trafficking, gender inequality as well as labour rights violations and unsafe working conditions (Ariom et al., 2022; Fountain & Hütz-Adams, 2022; Gold et al., 2015). Although farmer cooperatives can increase bargaining power (Mohammed et al., 2012), smallholders lack the resources to tackle social, economic and environmental issues on their own, which thus requires multiple stakeholders to come together to ensure the supply chain security of cocoa over a longer time to make the cocoa production more sustainable (Camargo & Nhantumbo, 2016).

2.4 Chocolate and Climate Change

In addition to the complex social and cultural dimensions that govern cocoa farming, smallholders are impacted by environmental change, which negatively impacts the natural capital. Firstly, cocoa farmers rely on stable weather conditions as cacao trees depend highly on rainfall and correct temperature. Unexpected rainfall increases the risks of cocoa tree fungal diseases, such as Black Pod (Codjoe et al., 2013; Reay, 2019). Trees can be damaged through those changing conditions, decreasing yield and negatively impacting smallholder farmers' livelihoods (Ameyaw et al., 2018; Leandro-Munoz et al., 2017). Predictions suggest that climate change will intensify weather extremes and reduce the possible area of cocoa growth in West Africa if climate adaptation practices are not implemented (Läderach et al., 2013; Schroth et al., 2016). These issues link back to the economic problem, as farmers have to adapt to a changing climate while not being able to invest in different processes without external support or expanding the harvesting area. Expanding cocoa harvesting to meet the increase in demand and counter climate change impacts can reduce food croplands, which might threaten food security. Thus, the cocoa industry should implement measures to ensure future profitability and successful harvest (Ajagun et al., 2021; Läderach et al., 2013).

Moreover, farmers turn to deforestation to increase the agricultural area of cacao production, which is also influenced by social, economic and traditional cultural contexts (Ruf & Schroth, 2004). The increase in global chocolate demand led to Côte d'Ivoire losing 90% and Ghana losing 65% of its tropical forest in the past 30 years (Fountain & Hütz-Adams, 2022). A chocolate company's sourcing strategy plays a significant role in deforestation risks as, for instance, in Côte d'Ivoire, almost 60% of deforestation can be attributed to the untraced

sourcing of cocoa (Renier et al., 2023). Losing forests leads to a loss in climate-carbon storage systems which can no longer play a role in mitigating climate change. Thus, focusing on this step within the supply chain is crucial when considering climate mitigation strategies.

Nevertheless, although cocoa farmers are aware of climate change and its implications, climate mitigation and adaptation strategies are facing roadblocks in implementation (Codjoe et al., 2013). These include illegal logging practices, the fragmentation of cocoa farms, and cultural practices that are connected to carbon release as soon as the productivity of the cocoa trees declines, for instance, tree removal for appropriate shade levels or causing trees to die before their end of life (Ameyaw et al., 2018; Codjoe et al., 2013). Moreover, most farmers in Ghana did not see benefits from climate change training programs by NGOs or the government, as they did not meet farmer needs (Codjoe et al., 2013). Therefore, Ameyaw et al. (2018) recommend a bottom-up and participatory approach, which includes the specific needs of the farmers and their communities. Moreover, when approaching smallholders and their challenges, the cultural context should be reviewed critically, while flexibility in strategies is needed to allow the focus on this factor (Ameyaw et al., 2018).

2.5 Scope 3 Emissions

Background on Industry Emissions

According to the IPCC (2022), 22% of anthropogenic greenhouse gas (GHG) emissions are linked to the agriculture, forestry and other land use agriculture (AFOLU) sector, while half of these emissions come from land use, land use change and forestry. Thus, climate mitigation strategies are needed, especially due to an expected increase in population growth and food demand (van Dijk et al., 2021). Nevertheless, creating accountability for GHG pollution is challenging, so the GHG Protocol was developed as an accounting methodology to measure companies' GHG emissions (World Resource Institute & World Business Council for Sustainable Development, 2011). GHG emissions are classified into three different Scopes. Scope 1 considers the direct GHG emissions a company emits; Scope 2 includes the indirect emissions from purchased or acquired electricity, steam, heating and cooling, while Scope 3 is based on all other indirect emissions connected to a company. Scope 3 is split into 15 categories, including eight upstream and seven downstream activities (World Resource Institute & World Business Council for Sustainable Development, 2011). Considering climate mitigation scenarios to reach a 1.75°C warming, AFOLU Scope 3 emissions should be reduced by 39% by 2035 with a baseline of 2014 (Li et al., 2019). Moreover, the Science Based Target initiative target setting standard requires an average 3.03% emission reduction per year between 2020 and 2030 in alignment with the Paris Agreement (Anderson et al., 2022). This highlights the necessity to tackle those emissions through appropriate mitigation strategies.

Roe et al. (2019) state that the median mitigation potentials in the land sector can contribute to about 30% of the total mitigation needed globally between 2020 and 2050.

Scope 3 Emissions comprise more than 85% of the total GHG emissions in the Food, Beverage and Tobacco sector, including chocolate firms. Moreover, category 1: Purchased Goods and Services, comprise 67% of the total emissions (Carbon Disclosure Project, 2023). This puts the focus of climate mitigation on the supply chain of those companies. Furthermore, Konstantas et al. (2018) found that raw materials, when excluding land-use change (LUC) from cacao, are the main contributor to a chocolate bar with 67% to 81% of CO₂ equivalents, followed by manufacturing (8% to 16%) and packaging (8% to 13%). When including LUC in the calculation, 70% of the CO₂ eq. of a chocolate bar can be linked to cocoa butter itself (Konstantas et al., 2018). Likewise, in Peru, land use change can make up between 84% and 99% of the carbon footprint of cacao bean cultivation, depending on the production type (Ivanova et al., 2020). Nevertheless, LCAs are difficult to compare due to different system boundaries, resulting in Land Use Change emissions reaching from 4.82 to 41.16 kg CO₂ equivalent per kg cacao (Vervuurt et al., 2022). Nevertheless, on a farmer level, land use change effects are crucial due to their high impact when considering climate mitigation strategies.

Calculation Challenges for Companies

Accurate Scope 3 emission measurement is challenging (Shrimali, 2022). Calculating Scope 3 emissions relies on secondary data based on industry averages, which might lead to data not being representative of the actual emissions. Due to different calculation approaches and the quality of data, inconsistencies in corporate carbon performance data occur despite standardisation efforts (Busch et al., 2022). Using primary data can be a burden, as it requires supplier knowledge, a good connection to suppliers, and the need to go beyond Tier 1 suppliers (Li et al., 2019; World Resource Institute & World Business Council for Sustainable Development, 2011). The GHG protocol recommends improving data quality over time (World Resource Institute & World Business Council for Sustainable Development, 2011). As Scope 3 measurement and calculation make sub-suppliers more relevant, this can be seen as a challenge in chocolate manufacturers' highly fragmented supply chains (Grabs & Carodenuto, 2021), which have limited traceability due to indirect sourcing practices (Renier et al., 2023). Thus, supplier engagement has to be improved for efficient measurement and to enact climate change mitigation strategies, while effective supply chain governance and management mechanisms have to be implemented.

2.6 Climate Change Mitigation Strategies in the Upstream Chocolate Supply Chain

As discussed previously, the primary source of GHG emissions for chocolate manufacturing is smallholder farmers' primary cacao production, especially due to Land Use Change (LUC) and land management activities. Thus strategies impacting this part of the supply chain will be especially highlighted as those strategies are most likely to impact smallholders. Within literature, emission reduction strategies are not necessarily framed as Scope 3 emission reduction strategies but classified as sustainable cocoa strategies that include climate mitigation measures. The following strategies are a collection of findings from the literature to show the potential approaches to climate mitigation.

Climate Mitigation Strategies

Considering the supply-side options for climate mitigation within the AFOLU sector, possible actions include protecting forests, restoring forests and improvements in forest management while reducing emissions within agriculture and sequestration of carbon through agroforestry (Anderson et al., 2022; Nabuurs et al., 2022; Roe et al., 2021). Within cocoa, forest protection can be applied by reducing or halting deforestation. Moreover, afforestation and reforestation strategies can be implemented on previously degraded lands (Table 2). Roe et al. (2019) highlight the need to understand the local context when implementing such measures and that coordinated action of various stakeholders is required.

Agroforestry is a land-use approach where trees or shrubs are grown while interacting with other crops (Nair, 2005). Cocoa-based agroforestry systems can sequester carbon, binding additional CO₂ equivalents in biomass and soil (Arimi & Omoare, 2021; Middendorp et al., 2018). Moreover, cocoa agroforestry includes climate mitigation co-benefits, such as reducing deforestation, as wood for heating and additional food can be grown on the farm (Arimi & Omoare, 2021). Furthermore, cocoa agroforestry shade trees can enhance biodiversity, carbon sequestration, soil fertility, and drought resistance while being more effective for productivity for young cocoa trees (Tschardt et al., 2011). Furthermore, cocoa agroforestry can restore degraded land (Jagoret et al., 2012; Kouassi et al., 2021; Orozco-Aguilar et al., 2021). According to Jezeer et al. (2017), cocoa agroforestry can improve economic performance due to higher cost-efficiency despite decreasing yields. Armengot et al. (2016) state that agroforest systems have higher returns on labour than monocultures when by-crops are included, which can serve as an extra income source through the availability of local markets. In addition, deploying agroforestry can diversify smallholder farmer income sources through additional fruit trees or selling carbon offset credits on the voluntary carbon market. Providing this information to the farmers can increase the adoption rates of agroforestry (Arimi & Omoare, 2021). Nevertheless, deploying agroforestry needs to be specific to the context, as using different types of shade trees for cocoa can also have a worse impact on drought

resilience (Abdulai et al., 2018). Cocoa agroforestry efforts have to be viewed critically, as definitions vary within the chocolate industry (Sanial et al., 2020), which can include low shade standards that are replacing more biodiverse agroforestry systems. Moreover, setting up agroforestry systems requires the training and education of cocoa farmers (Sanial et al., 2020). Tscharrntke et al. (2011) recommend incentives for adopting agroforestry through, for instance, the payment for ecosystem services and certification schemes to mitigate the risk of cutting down shade trees.

Table 2: Summary of Most Important Climate Change Mitigation Strategies in the AFOLU Sector

Mitigation Strategies (AFOLU Sector)	Short Description	Source(s)
Forest Protection / Conservation Efforts	Efforts mainly include reducing or halting deforestation.	Nabuurs et al. (2022), Anderson et al. (2022), Roe et al. (2021)
Forest Restoration Efforts	Afforestation & Reforestation Efforts	Nabuurs et al. (2022), Anderson et al. (2022), Roe et al. (2021)
Improving Forest Management & Agroforestry	Agroforestry: Land use approach where trees and shrubs are grown with other crops interacting, leading to carbon sequestration. Can have a variety of co-benefits.	Nabuurs et al. (2022), Anderson et al. (2022), Roe et al. (2021), Arimi and Omoare (2021), Supriadi et al. (2022), Nair (2005)
Improve Agricultural Practices	Actions such as reduced use of fertilizers or productivity increase	Nabuurs et al. (2022), Anderson et al. (2022), Roe et al. (2021)

Furthermore, traditional offsetting of CO₂ emissions can be conducted by purchasing carbon credits from emission reduction outside the supply chain. These efforts are not contributing to an actual reduction in emissions within a company’s cocoa supply chain and are thereby not considered a mitigation strategy in this thesis.

Company Action

Chocolate manufacturers can engage with suppliers and smallholders in various ways to pursue the climate mitigation strategies discussed previously. Engaging suppliers and smallholders in supply chain initiatives can *commitments*, such as high-level pledges or collective commitments (Bakhtary et al., 2020; Lambin et al., 2018), *policies*, including production and procurement standards, *implementation measures* through operational changes, knowledge generation, collaborative approaches on a landscape or area-specific

level, and support building programs, and *evaluation and monitoring* through compliance (Bakhtary et al., 2020). Supply chain initiatives can be initiated by the chocolate manufacturers but run through NGOs or in cooperation with other actors.

High-level pledges can include a net zero target that includes Scope 3 emissions. These can be developed under specific frameworks, such as the Science Based Target initiative (SBTi), to show climate leadership and commit to emission reduction. Besides the reasoning for climate mitigation described previously, the target can also lead to keeping the social license to operate, which relies on stakeholder support to continue the business activities (Smits et al., 2016). Target setting requires reporting and measuring emissions, ensuring that mitigation strategy progress can be quantified.

As land use change and deforestation practices significantly contribute to greenhouse gas emissions of chocolate (Konstantas et al., 2018), non-deforestation action would reduce LUC greenhouse gas emissions. Moreover, a zero-deforestation commitment is, for instance, required for an SBTi Net Zero Target for the AFOLU Sector, while reducing land use change, forest restoration, sustainable forest management, and agriculture should be prioritized (Science Based Targets initiative, 2022).

As discussed previously, engaging with suppliers is conducted through assessment and collaboration (Grimm et al., 2016). Common mechanisms considering supplier assessment to adopt SSCM practices and implementing sustainable sourcing strategies can be an internal code of conduct, third-party certification, following best practices in the industry, and certification on the designation of origin for implementing sustainable sourcing strategies (Jia et al., 2018; Lambin et al., 2018). Collaboration mechanisms, such as direct supplier development, buyer-NGO partnerships, engaging in supplier networks and stakeholder engagement, can also be used to move towards a more sustainable supply chain (Jia et al., 2018).

In addition, companies can deploy sustainable sourcing strategies through verified and certified sourcing from cooperatives or suppliers that adhere to environmental standards, which can have positive climate mitigation effects (Fountain & Hütz-Adams, 2022). Internal due diligence processes through proactive and reactive measures can assist in implementing those policies (Bakhtary et al., 2020). Moreover, Renier et al. (2023) recommended the collaboration of chocolate companies at the landscape level to increase the effectiveness of sourcing initiatives. As cocoa in Ghana and Côte d'Ivoire takes up a large part of the landscape, it indirectly leads to deforestation by pushing other commodities or crops inside protected areas (Ajagun et al., 2021). Thus, companies should work outside their supply chain, together with other industry and non-industry actors, such as governments and NGOs, to halt deforestation practices where cocoa plantations are expanding (Renier et al., 2023).

When working with certifications and standards, it has to be acknowledged that some smallholders might be excluded from market access, as they might grow their cocoa in protected areas or they are not able to follow the deforestation standards due to a lack of technical knowledge or their cultural cultivation and harvesting practices (Lambin et al., 2018). Moreover, circa 45% of imports to the EU from Côte d'Ivoire could be traced to a farmer cooperative in 2019, meaning there is still a knowledge gap on farmer practices through indirect sourcing practices (Renier et al., 2023). Thus, traceability and transparency actions are required to determine appropriate practices. These actions can, for instance, include satellite monitoring of cocoa production in protected areas and used as risk assessment in the procurement strategy (Abu et al., 2021).

Besides interacting with Tier 1 suppliers, on an operational basis, technical, financial, technological and institutional support should be provided to smallholder farmers to implement the company pledges and strategies. This can include support through training, providing smallholders with financial means and new infrastructure or technology, and enabling access to knowledge (Bakhtary et al., 2020). These programs can vary significantly in the time frame and the number of stakeholders involved and support, but they are important due to the social, economic and environmental challenges smallholders and their families face (Ariom et al., 2022).

Overall, Ameyaw et al. (2018) state that climate change mitigation strategies should use a participatory approach according to the smallholder needs, as farmer participation is crucial for a strategy's success. Bottom-up approaches with a "think big, but start small" (p.15) process are recommended, while the inclusion of farmers in the design of climate mitigation strategies is important to understand potential impacts better (Ameyaw et al., 2018). These approaches might also lead to further empowerment of smallholders. Table 3 summarizes possible actions to promote and implement cocoa mitigation strategies, while supply chain transparency and smallholder support were determined as prerequisites for effectiveness (Ariom et al., 2022; Bastian & Zentes, 2013).

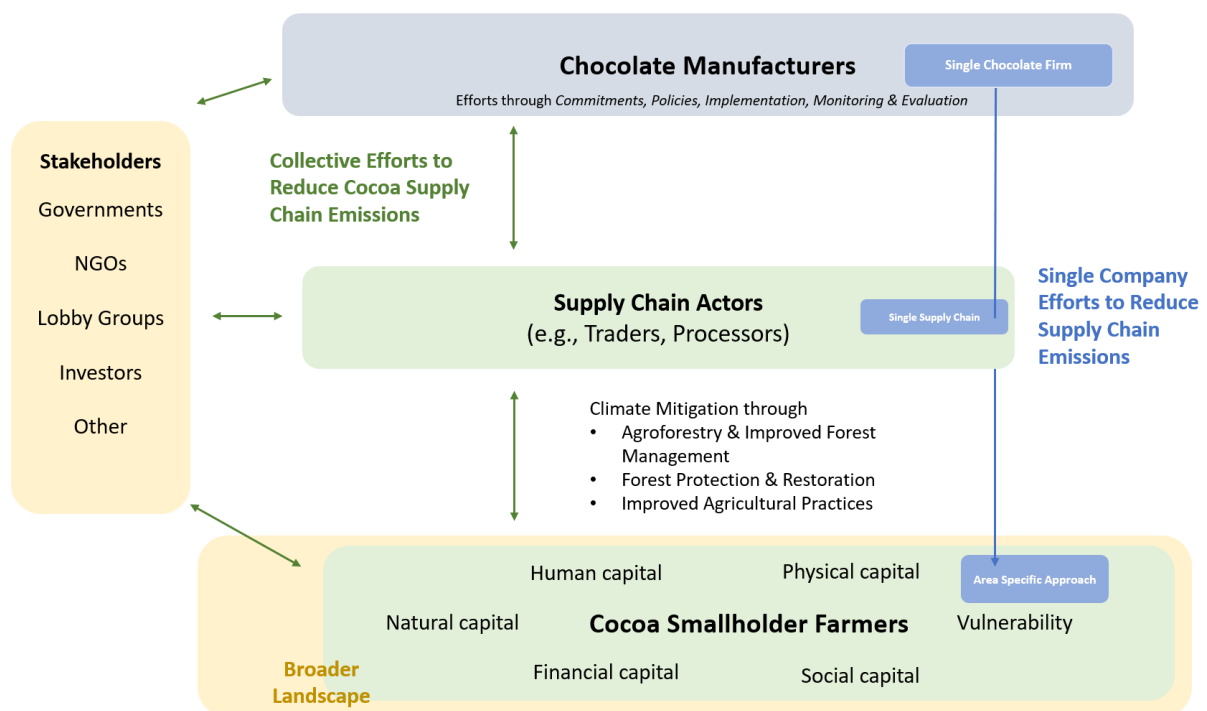
Table 3: Summary of possible Actions on the level of a chocolate manufacturer to implement climate mitigation, own graph derived from Bakhtary et al. (2020) and Lambin et al. (2018)

Possible Chocolate Manufacturer Actions to Promote/Implement Mitigation Strategies	Possible Actions Based on Literature
Prerequisites for Effective Climate Mitigation Strategies	Supply Chain Transparency (incl. traceability of cocoa); Technical, technological, institutional and financial support for implementation
Commitments	<ul style="list-style-type: none"> • Traceability • Net Zero Targets, Emission Reduction Targets including Scope 3 • Deforestation • Agroforestry • Sustainable Sourcing
Policies	<ul style="list-style-type: none"> • Procurement Policy (Sustainable Sourcing, Certification) • Production Standard (e.g. Deforestation Free Cocoa)
Implementation	<ul style="list-style-type: none"> • Supply Chain Traceability & Transparency measures • Supplier Code of Conduct • Internal Due Diligence Processes • Supplier Assessment Practices • Supplier Collaboration on Climate Mitigation • Risk Assessments, Reporting and Disclosure • Area-specific approaches • Landscape-specific approaches • Collaborative Approach (Public-sector, NGO, Governments, among others) • Smallholder Support Programmes • Bottom-up Engagement with Smallholder
Evaluation and Monitoring	<ul style="list-style-type: none"> • Audits (Internal or Third-Party) • Key Performance Indicators

2.7 Combining Theories for Theoretical Framework

As discussed previously, SCM and SCG include managing and governing the companies' supply chain to gain a competitive advantage, influence suppliers, and make the supply chain more sustainable (Chapter 2.2). These efforts can include single-company efforts such as a sustainable sourcing strategy through internal sourcing standards or participating in a landscape approach through multi-stakeholder initiatives. These landscape approaches consider a broader view and address trade-offs between different actors and their individual strategies (Arts et al., 2017; Zinngrebe et al., 2020). This study's landscape refers to collective efforts to reduce cocoa supply chain emissions. Moreover, the SLA and the five types of livelihood capital have been introduced to evaluate chocolate company strategies' impacts on smallholder farmers. A conceptual framework was developed, combining the horizontal supply chain approaches with the vertical sustainable livelihood approach (SLA) (Figure 3) while detailing that chocolate manufacturers' efforts can be classified into commitments, policies, implementation, and monitoring. Plausible outputs of supply chain actions are impacting smallholder livelihoods by influencing the different livelihood capitals. This multidimensional perspective assists in elaborating the impacts of climate mitigation strategies implemented by chocolate firms and how they could contribute to changes in the livelihoods of smallholder cocoa farmers. The SLA offers a perspective to categorize possible benefits and harms of the strategies deployed, while including the wider supply chain provides more context on the decisions made (Busquet et al., 2021).

Figure 3: Conceptual Framework, own graph



3. Research Methodology

3.1. Research approach and design

A qualitative approach was chosen to investigate the research questions based on the explorative nature of the study. The methods used included an academic literature review for background information, document analysis and semi-structured interviews to investigate the topic further through a case study.

Overall Steps

1. Literature Review: Identification of Possible Strategies and Framework Development
2. Document Analysis
 - Sustainability Reports, Websites, Videos, and Procurement Policies, among others
3. Case Study
 - Sustainability Reports, Websites, Videos
 - One semi-structured interview
4. Three semi-structured expert Interviews
5. Analysis and Discussion

3.2 Methods for data collection and analysis

3.2.1 Literature review

The author used an integrative literature review to combine theoretical views to create new models (Snyder, 2019). The tool “Connected Papers” was used to create clusters of strongly connected papers based on co-citations and similarity to ensure that relevant literature was examined. Moreover, citations from articles obtained through databases like Google Scholar and Web of Science were reviewed. Multiple search terms were used, such as “cocoa ‘climate change mitigation’”, “Scope 3 emissions chocolate”, and “Cocoa AND ‘sustainable supply chain management’”. A concept matrix was developed to understand better the relationships between the topics (Rowley & Slack, 2004). This led to more tailored literature reading and the creation of the themes and topics discussed in the previous chapter. The literature review followed a synthesising approach to include the core literature to ensure better understanding through developing a conceptual framework while depicting relationships (Torraco, 2005).

3.2.2 Document Analysis

The sample selection was based on The Chocolate Scorecard, which provides an overview of the sustainability efforts of chocolate manufacturers, cocoa traders and processors, scoring them in cooperation with universities, consultants and industry experts across different categories from 1 to 4, while 1 being a leader in the industry on policy and 4 meaning that the

company has to catch up with the industry (Be Slavery Free, 2023). Based on the 2023 report, a first sample of 20 companies was selected. The sample was reduced to ten companies due to the aim of providing insights on strategies of industry leaders and thereby including companies that have lower averaging scores of 2 of the assessment categories “Traceability & Transparency”, “Deforestation and Climate”, and “Agroforestry”, which are relevant based on desk research. The selected companies are displayed in Table 4, including eight manufacturers, one trader and manufacturer, one trader and processor, and one trader that has been included despite the higher score to get a more diverse set of supply chain actors. All documents were obtained to understand the supply chain efforts of the companies, which led to the inclusion of videos, information on the company websites, sustainability reports, and internal procurement policies. The documents were coded using the software Atlas.ti to ensure a systematic data collection approach. A total of 73 documents were coded, while strategic approaches were summarized. The complete list of documents can be found in Appendix A.

Table 4: Sample Selection

Ranking Chocolate Scorecard	Company	Headquarter	Stakeholder Group	Score	Documents	Note
1	Original Beans	The Netherlands	Manufacturer	1	Website, Report	Craft – Chocolate Business model is based on sustainability and premium taste
2	Tony's Choclonely	The Netherlands	Manufacturer	1	Website, Sustainability Report	High focus on social sustainability
3	Beyond Good (Single Origin Chocolate)	United States of America	Manufacturer	1	Website	Single Origin Chocolate with chocolate manufacturing in cocoa harvesting country
4	Alter Eco	Netherlands	Manufacturer	1		Excluded due to language barrier
5	Halba	Switzerland	B2B Manufacturer	1	Website, Sustainability Report, Several Internal Policies	
6	Alfred Ritter GmbH & Co. KG	Germany	Manufacturer	1,67	Website, Sustainability Report, Other	Case Study
7	Ben & Jerry's	United States of America		2		
8	Cémoi	France	Trader, Manufacturer	1,67	Sustainability Report, Other	
9	Whittaker	New Zealand		2		

10	Nestlé	Switzerland	Manufacturer	1,67	Website, Sustainability Report, Internal Policies	
11	Hershey	United States of America		2		
12	Ferrero	Luxembourg	Manufacturer	1,67	Website, Sustainability Report, Internal Policies	
13	ETG (Beyond Beans) ^	The Netherlands & Mauritius	Trader	2,33	Website, Project Report	
14	Mars Wrigley	United States of America	Manufacturer	1,67	Website, Sustainability Report, Internal Policies	
15	ECOM	Switzerland	Trader, Processor	2,33	Website, Sustainability Report, Internal Policies	
16	Barry Callebaut	Switzerland	Trader	2,33		
17	Cargill	USA	Trader	2,33		
18	Ofi	Singapore	Trader	2,67		
19	Pladis	United Kingdom		2,67		
20	Lindt & Sprüngli	Switzerland	Manufacturer	2,33		

^ included due to more diverse company profile; Colour code: grey: Excluded from document analysis; White: Included

Score as average from the “Chocolate Scorecard” of Be Slavery Free (2023): 1: Leading the industry on policy; 2: Making progress on implementing policies; 3: Starting to implement good policies; 4: Needs to catch up with the industry;

For the analysis of the documents, deductive coding served as an appropriate method based on previously identified literature. The coding followed an iterative process, while the research was open to developing new codes. The list of codes can be found in Appendix B. The document analysis thereby serves as a validation to determine if strategies from literature are being implemented in practice and add to the literature by determining different approaches.

3.2.3 Expert Interviews

Three semi-structured expert interviews complement the document analysis to include additional insights and critical evaluation of the strategies. Table 5 details the participants and the purpose of selection. The interview structure was adapted after a role-play interview, as the outcome of an interview depends on the preparation of the researcher (Bryman & Bell, 2011; Saunders et al., 2016).

Table 5: Expert Interview Participants

Participant	Company	Date	Position	Location	Purpose
P1	Cocoa Industry Network	23.06.23	Manager	Ghana	Expert view on strategies and impact on smallholders
P2	Small Consultancy on Commodities and Sustainability	11.07.23	CEO, Cocoa Commodity Expert	United Kingdom	Expert view on cocoa commodity market and supply chain
P3	Small Sustainability Consultancy	12.07.23	Consultant, Cocoa Sustainability Expert	the Netherlands	expert view from sustainability consulting project in cocoa industry

All interviews were transcribed. The data collected in the interviews were then coded to determine common themes. The analysis followed a deductive coding approach similar to the document analysis, adding new codes depending on the interview contents.

3.2.4 Case Study

First, the selection of the case study followed the criteria of the document analysis to provide further insight by providing an in-depth view of one of those chocolate firms. Moreover, the case study should serve the purpose of determining more insights in answering the research questions. This approach was used to better understand the topic by elaborating strategies

through one example. Secondary and primary data sources, as Saunders and Lee (2017) recommended, were used to ensure data triangulation. Data was collected through desktop research on the company and its sustainability efforts. Secondary data included company reports, newspaper articles, podcasts, and videos, while primary data collection was based on one qualitative semi-structured interview with an employee in the firm's sustainability field (Table 6). The insight knowledge of the interview was used for triangulation. The data collected was assessed based on the literature review and the framework developed, while the results were connected to findings from the expert interviews. Taking the Alfred Ritter GmbH & Co. KG as a case study is an appropriate choice, as the company is in family hands, thereby thinking in generations when approaching their business. This long-term thinking is required in sustainability (Ahi & Searcy, 2013).

Table 6: Case Study Interview

Participant	Company	Date	Position	Location	Purpose
P4	Alfred Ritter GmbH & Co. KG	12.07.23	Sustainability	Germany	Primary data directly from chocolate manufacturer

3.3 Ethical Consideration and Limitations

Ethical Considerations

The research process should not harm participants (Saunders et al., 2016). Ensuring this, all interviewees were informed about the data collection process and their rights while having the possibility to withdraw from the interview at any time. Moreover, interviewees signed a research consent form based on the Maastricht Sustainability Institute template, where rights were explained. Considering data storage, interview recordings were stored on a local and external password-protected hard drive. Moreover, all interviewees were anonymised based on personal preference and to ensure personal data protection.

Limitations

First, the research approach was based on limited time and resources, which led to limited primary data connection. Moreover, based on the explorative nature of the topic on potentially sensitive topics of greenhouse gas emissions and smallholder farmers' livelihoods, the data-gathering process posed a more significant challenge than initially anticipated. To answer the research questions in more detail, more interviews with the cocoa supply chain actors should have been conducted.

Second, taking a constructivist research approach which has the understanding of phenomena as a primary goal and recognizes that phenomena can be observed in a variety of ways (Moses

& Knutsen, 2019; Offermans & Glasbergen, 2017), the research methods chosen pose a variety of limitations as they offer potential for bias. Within the document analysis, official company reports are mainly used to explore different strategies and determine possible impacts on smallholder livelihood. When working with data published by companies, the information bias can be high as companies might create reputational facades to improve legitimacy and increase acceptance among stakeholders reading the reports (Cho et al., 2015). The external expert interviews were conducted to reduce company bias and add to the information provided through a more critical lens.

Third, a case study approach can be critiqued for the extent of generalization, especially with the limited amount of primary data collected (Saunders & Lee, 2017). As the case study functions more as an illustrative example of possible strategies and impact, generalization was not the initial intent of the research but rather highlighting one specific approach. Fourth, answering the third research sub-question on the impacts on smallholder livelihood through the SLA requires more primary data from smallholder farms involved in those strategies. Due to time constraints, it was not possible to include primary data from smallholders, which poses a limitation in assessing actual impacts. Last, developing a theoretical framework depends on the researcher's skills. As an outsider to the chocolate industry and theories relating to this field, the researcher acknowledges that an inside view into the sector prior to the research would have been helpful for a more thorough research process.

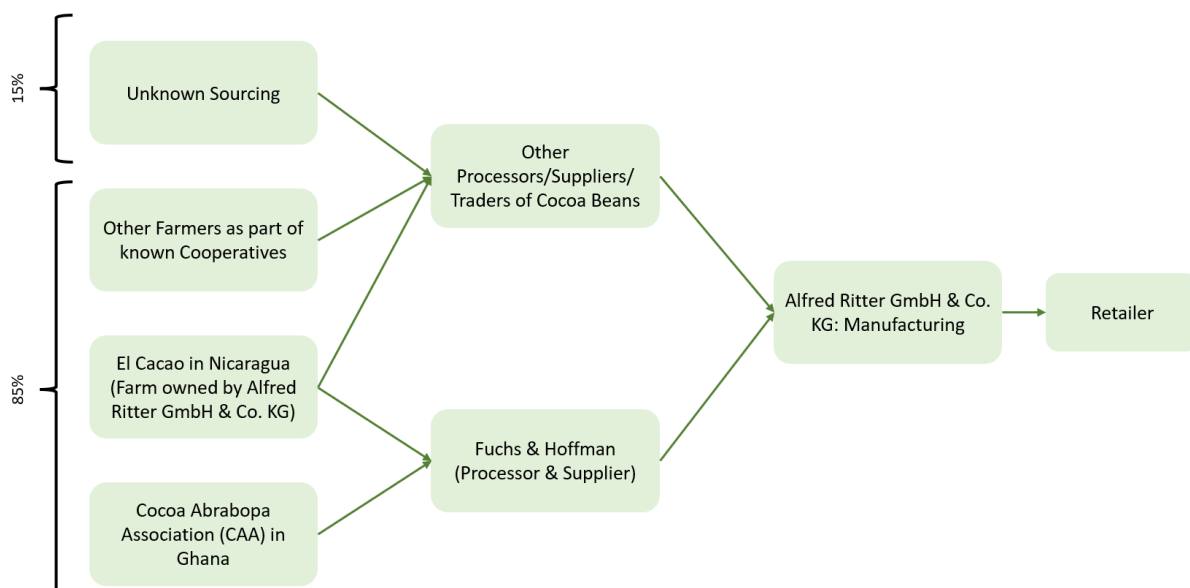
4. Results

In the following, the results of the data collection process will be structured by the three sub-questions of the research. First, a short introduction to the case study will be provided. In every subsequent chapter, results from the case study, the document analysis and expert interviews are introduced and connected. Documents will be referred to according to the identifier in the document list in Appendix A. The document analysis results are summarized in Appendix C.

4.1 Introduction to the Case

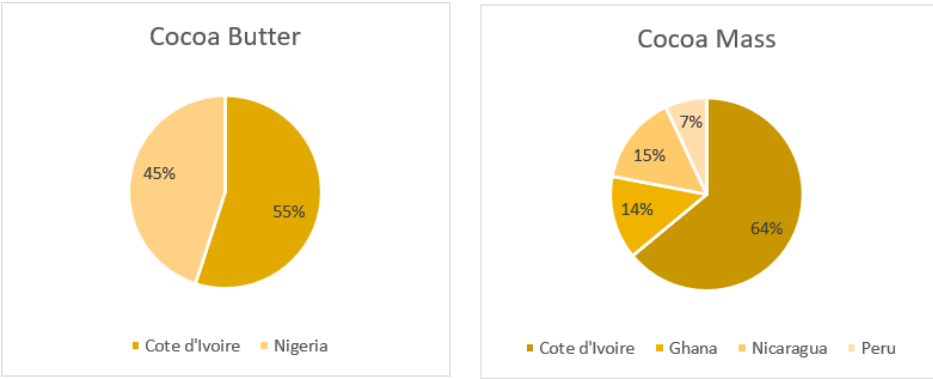
The Alfred Ritter GmbH & Co. KG, known through its chocolate brand “Ritter Sport”, is a family-owned chocolate manufacturer based in Waldenbuch, Germany, founded in 1912. The company has a high market presence of 99% in Germany and a turnover of approximately 500 million euros in 2021 (Alfred Ritter GmbH & Co. KG, 2023e). Ritter Sport has been transitioning to more sustainable practices over the last two decades leading towards “100% certified sustainable cocoa” since 2018 (Alfred Ritter GmbH & Co. KG, 2021, 2023b). The current owner of the company, Alfred Ritter, stated that one vision is “dealing harmoniously with the world” (SWR, 2021, 5:50). Its sustainability efforts led to the company winning the German Sustainability Award as “Germany’s most sustainable medium-sized company” by focusing on the whole value chain of chocolate manufacturing (Stiftung Deutscher Nachhaltigkeitspreis, 2018). Thus, assessing Ritter Sport's actions and their potential impact on the farmers helps explore the interlinkages between the topics in close detail and the reasoning behind deploying specific strategies. The company’s supply chain is shown in Figure 4, detailing that 85% of sourced cocoa comes from partnerships, while 15% are from unknown sourcing (Alfred Ritter GmbH & Co. KG, 2023c).

Figure 4: Simplified Cocoa Supply Chain of Albert Ritter GmbH & Co. KG, own graph, information derived from Alfred Ritter GmbH & Co. KG (2021) and Alfred Ritter GmbH & Co. KG (2023c)



Ritter’s sourcing by country can be seen in Figure 5. This figure shows that the company procures its cocoa from the leading cocoa-sourcing regions around the globe (Alfred Ritter GmbH & Co. KG, 2023c).

Figure 5: Cocoa Butter and Cocoa Mass sourcing countries derived from Alfred Ritter GmbH & Co. KG (2023c)



Alfred Ritter GmbH & Co. KG collaborates with farmer cooperatives in Nicaragua, Ghana, Peru, Nigeria and Côte d’Ivoire, focusing on long-term partnerships (Alfred Ritter GmbH & Co. KG, 2021). Despite the relatively small buying power in the global cocoa markets, Ritter is a significant private actor within the Nicaraguan cocoa market, buying fermented beans at a premium price based on quality standards. Due to limited market regulation in Nicaragua, private actors can set production standards and the rules of production through, e.g. providing technical assistance to ensure quality standards through certifications (Wiegel et al., 2020). In 2020, 80-85% of purchased cocoa was Rainforest Alliance certified, while 15-20% was Fairtrade certified, acknowledging that these certifications are only a minimum requirement for sustainable cocoa (Alfred Ritter GmbH & Co. KG, 2023f).

The company’s sourcing strategy evolves around 30 criteria with key performance indicators that have to be implemented by the purchasing department. Moreover, a standard with 25 social, economic, and environmental goals was set that all suppliers must fulfil in the future (Alfred Ritter GmbH & Co. KG, 2021). The company goal of 100% traceability by 2025 will be achieved by creating long-term partnerships with cooperations, such as the Cocoa Abrabopa Association (CAA) in Ghana, including around 6000 cocoa farmers. At the heart of the company's cocoa strategy sits its cocoa farm, *El Cacao*, in Nicaragua. Ritter purchased 2500 hectares of land in 2012 and built an agroforestry cocoa plantation, employing 450 people in 2022 (Alfred Ritter GmbH & Co. KG, 2023a), that not only provides cocoa beans but also includes the creation of carbon offsetting certificates in cooperation with the Gold Standard (Alfred Ritter GmbH & Co. KG, 2021), a standard setter for the creation of voluntary carbon market offsetting projects (Gold Standard, 2020). The company uses these certificates for insetting, a process where offsetting certificates are created in the own supply chain to

compensate carbon emissions (Pledran et al., 2019), assisting in claiming carbon neutrality of their production plant in Waldenbuch (Alfred Ritter GmbH & Co. KG, 2021). Moreover, the farm provides employees with health care, and machinery is used to open cocoa pods to reduce the risk of injury, aiming for a humanitarian approach to cocoa production (Siller, 2021). By owning its farm, the company realized the adverse impact of climate change on their farm by experiencing two seasons without a rainy season and flooding, which led to a learning process within the firm that cocoa production needs to change on a broader scale (Siller, 2021).

4.2 Mitigation Strategies

As discussed in Chapter 2.6, forest protection, conservation, restoration efforts, improved agricultural practices, forest management, and agroforestry are the main levers to reducing emissions within the cocoa supply chains. In the following, actions of chocolate companies leading in sustainability are deployed.

4.2.1 Traceability and Supply Chain Transparency

According to all three expert interviews, supply chain transparency and traceability of cocoa is crucial and a prerequisite to implementing efficient strategies. Thus, efforts to improve traceability are a prerequisite for effective climate mitigation strategies and relevant for a company's approach to improving farmer livelihoods (P1, personal communication, 23.06.23). According to the analysed documents, companies are committing to 100% traceability to farms or cooperatives and implementing strategies to increase traceability, such as polygon and satellite mapping (H9, EC4). Regarding transparency, some companies, such as Ferrero, ECOM, Mars, and Nestlé, publish a list of Tier-1 suppliers or farmer groups (F1, F3, EC3, M7, N9).

Ritter Sport is highly committed to long-term sourcing partnerships with cooperatives and achieved 85% of traceability to cooperatives in 2022, with a goal of 100% traceability in 2025 (AR7, P4, personal communication 12.07.23). Through entering sourcing agreements with selected cooperatives, traceability will be ensured. Next, Ritter Sport seeks to achieve 100% polygon-mapped cocoa beans on the farm level to determine yields directly connected to farms (AR3). Moreover, instead of working with multiple actors between the cooperative and their production, Ritter Sport aims to shorten its supply chain by working with one intermediary between farmers and chocolate manufacturing to ensure direct sourcing and traceability (AR7). Ritter understands the need for traceability, as only through direct partnerships and collaboration with farming cooperatives sustainable farm practices can be implemented through contractual agreements (P4, personal communication, 12.07.23). Moreover, Ritter Sports' sourcing through Fairtrade certification requires geolocation data from 2024 onwards (Fairtrade, 2023)a. Thus, traceability efforts will be further implemented based on this requirement.

In addition, P1 highlights that the EU Deforestation regulation reinforces company efforts in traceability while it allows measuring the impact of investments within a sourcing area. P2 highlights traceability as “how you achieve all of your sustainability goals” (P2, personal communication, 11.07.2023). Nevertheless, it was highlighted that there is a risk that the focus on traceability through external pressure of the EU regulation could be the main and only priority of company efforts in the upcoming years through strengthened efforts in GPS (polygon) and satellite mapping, which will take away the focus from a focus on climate mitigation and non-deforestation efforts (P3, personal communication, 12.07.2023).

4.2.2 Climate Mitigation Strategies

The document analysis revealed that the chocolate manufacturers apply various strategies to climate mitigation, as indicated in Chapter 2.6. P3 highlights, that sustainability strategies are responsive to external pressures as part of risk mitigation and protecting their reputation and recently, the focus has been on climate mitigation and deforestation. Most chocolate firms have climate neutrality or net zero targets by 2050, while some are members of the SBTi and set reduction targets accordingly (Appendix C). These commitments highlight the determination to climate mitigation within the sectors. Alfred Ritter GmbH & Co. KG has set a climate neutrality target in line with the Science Based Target initiative (SBTi) of achieving net zero by 2050 and reducing its GHG emissions by 42% across all scopes until 2030 with a baseline of 2021 (Alfred Ritter GmbH & Co. KG, 2023d). Moreover, being a climate-neutral company in Scope 1 and 2 through offsetting, the company set the target of offsetting all GHG emissions from 2025.

Forest Protection & Restoration Efforts

In terms of forest protection from deforestation, companies are committing to deforestation-free supply chains by a cut-off date, while traceability efforts and deforestation risk assessment are crucial in achieving those commitments. The document analysis shows that traceability is highly linked to zero deforestation efforts, as through data by polygon mapping, a risk assessment against protected areas can be conducted, leading to changes in sourcing practices (TC2, M7, H11). Certification of cocoa supply is an additional measure to increase traceability, as standards such as Fairtrade require 100% geolocation data from 2024 onwards to identify the deforestation risk and prevent deforestation (Fairtrade, 2023). These efforts are essential as chocolate emissions come from land use change activities (Konstantas et al., 2018). P2 highlighted that reinforcing those certifications might be challenging due to the opportunity for fraud based on the complex supply chain. Thus, companies also joining collective initiatives, such as the Carbon and Forest Initiative (CFI), focusing on addressing deforestation, livelihoods and agroforestry in Ghana and Côte d'Ivoire, which requires the development of actions plans in cooperation with the public sector (H12, C2, ETG1, EC4, F6, M14).

Next, procurement policies of chocolate firms entail combating deforestation (F1, C1, H11), and policies on halting deforestation are developed (H9). Specific actions include, for instance, the provision of more efficient cookstoves, which reduce the need for wood which might be sourced outside of the farms leading to further deforestation (ETG2, N3). Due to a lack of landscape approaches, pilot projects on reducing deforestation are undertaken (M4). P1 highlights the need to include a broader landscape approach to tackle the emission reduction issues, as working only within the own supply chain might lead to losing sight of the larger issues, as decreasing deforestation in one supply chain might increase it in another (P1, personal communication, 23.06.2023).

In terms of reforestation, often on-site practices are undertaken, which will be addressed later, as they are closely linked to agroforestry systems. Nevertheless, ECOM and Original Beans, for instance, offer off-farm restoration projects through payment for ecosystem services (EC5, OB2).

Ritter Sport commits to deforestation-free supply chains by stating that no forest should be harmed for cocoa production (AR7), highlighting that collaboration with suppliers and the broader chocolate network is essential (P4, personal communication, 12.07.23). Moreover, Ritter Sport's cocoa support programs partly include forest protection and restoration efforts. For instance, one project in Côte d'Ivoire relies on the sensibilization of farmers on deforestation in communities through a theatre play (AR7). The projects implemented are conducted in collaboration with other supply chain actors and NGOs that provide further local knowledge to address the farmers appropriately and find specific solutions. In Nicaragua, the company relies on polygon mapping to increase traceability for deforestation risk assessment (AR7), which might be based on their direct influences in the cocoa sector within the country.

Improved Agricultural Practices

Improved agricultural practices can be crucial in boosting farm yields and mitigating the risks associated with further deforestation (C1, EC5). These practices are often integrated with existing extension services, which involve activities like distributing additional cocoa seeds (P2, personal communication, 11.07.23) and providing farmer coaching (C1, EC5).

Furthermore, companies are actively exploring alternatives for fertilizers to minimize emissions, including deploying and developing local composters (ETG1, AR7). At the same time, pilot projects aim to offer valuable insights into enhancing productivity through efficient fertilizer and pesticide usage (M5). In the context of ETG/Beyond Beans, a noteworthy approach involves linking Payments for Ecosystem Services to providing fertilizers as payments (ETG4). This innovative strategy serves the dual purpose of safeguarding forests and increasing agricultural productivity.

Ritter Sport's cocoa projects focus on increasing productivity through the deployment of farmer training while providing tools to ensure a higher quality of cocoa (AR7). Actions in improving agricultural practices focus mainly on productivity increases, thereby having only minor effects on climate mitigation.

Improved Forest Management & Agroforestry

In terms of agroforestry, a variety of initiatives are undertaken by actors in the cocoa supply chain. Commitments include shares of cocoa sourced from agroforestry systems by a specific date and the number of farmers trained in agroforestry (EC5, F6, H8, M5). Companies are working on pilot and research projects to develop appropriate approaches to agroforestry and testing crop diversification (M5). The programs can be connected to additional financial remuneration if production standards are implemented while providing shade tree seedlings (AR5, N2). HALBA released an agroforestry policy and action plan, emphasizing the significance of training in their dynamic agroforestry approach. Simultaneously, they intend to extend support to smallholders to facilitate their transition to this agricultural approach (H8). Deploying agroforestry can also be connected to insetting, where carbon credits are created through reforestation or switching from a monoculture to a high-carbon agroforestry system (H8).

Ritter Sport is committed to 100% cocoa sourcing from agroforestry systems by 2035, with intermediary targets covering 100% of the supply chain by agroforestry programmes until 2025 (AR3). Nevertheless, they acknowledge the challenges in defining agroforestry and are currently working on developing their approach (AR3). The farm El Cacao produces cocoa based on an agroforestry approach, which serves as a proof of concept that this system can be used as an appropriate method for sustainable cocoa production and that a holistic approach is economically feasible (P4, personal communication, 12.07.23). Thus, Ritter Sport is using these results from the pilot to convince farmers and suppliers of the economic feasibility of agroforestry systems. Moreover, P3 highlights that as Scope 3 emissions are linked to land use change, agroforestry can at least partially reverse this by capturing more carbon. P3 and P4 point out the challenge that it takes time to develop those systems as farmers might not be easily persuaded to change to agroforestry from a monoculture, as “mitigating a little bit less of CO₂ emissions for the benefit of the world when they are living off a few dollars a day, [is] not a useful strategy.” (P3 personal communication, 12.07.23). According to P2 and P4, adoption rates of agroforestry are relatively low, which can be seen in chocolate companies mainly piloting this approach scale and slowly introducing the system to more farmers. P2 adds that agroforestry programs are deployed not only due to additional carbon sequestration or other co-benefits but also based on gaining more efficiency and productivity.

Other Strategies

Other efforts in reducing emissions in the cocoa supply chain were mentioned, such as establishing a connection to carbon markets for smallholder farmers based on implementing the agroforestry system, which can serve as an additional income source (ETG4). In addition, reducing waste material, such as cocoa husks, is being explored, as the rotting of those husks releases methane emissions (Ortiz-Rodríguez et al., 2016). Thus, companies, including Ritter Sport (SWR, 2021) and Ferrero, in cooperation with ETG/Beyond Beans (F5, ETG4), make efforts to use residual products to create cocoa juice made into lemonade for income diversification. Moreover, the creation of biochar from cocoa husks was introduced as a novel approach that needs further exploration (P3, Personal communication, 12.07.23). Overall, companies are deploying a variety of strategic approaches to implement climate mitigation strategies. This links to P1, stating that the adoption of climate mitigation action has recently increased, as companies are seeing the benefits of these actions, including increased productivity. The following chapter will discuss how these actions might affect the supply chain and smallholder farmers.

4.3 Implications for the Cocoa Supply Chain

The following will provide implications of the strategies on a landscape, supplier and smallholder level. The document analysis showed that all companies stress the importance of collaboration between all supply chain actors for implementing the previously described activities. Moreover, public-private collaborations were mentioned to ensure that deforestation-free sourcing pledges can be met (M5).

On a landscape level, pilot projects are being conducted to explore the feasibility of farming approaches (ETG4). Moreover, firms mentioned that additional landscape projects should be implemented, as large-scale afforestation and agroforestry strategies require industry collaboration (ETG4, M5, M10) on a local, national and international level (F1). Moreover, pre-competitiveness was mentioned in the context of providing knowledge exchange to enable transformation (M7). P2 highlights the need for pre-competitive collaboration, as this will prevent farmers from changing cooperatives to sell their cocoa produced in monocultures to other buyers. Nevertheless, it is highlighted that within the current economic system, pre-competitive approaches might be a challenge (P3, personal communication, 12.07.23)

Implications for suppliers are increasing requirements in cocoa production due to commitments towards traceability by chocolate manufacturers and regulators (P2, personal communication, 12.07.23): Furthermore, companies are starting to assess suppliers based on their environmental performance through platforms, such as EcoVadis (M12), while suppliers should adhere to code of conducts and procurement standards, including climate mitigation

commitments (C1, F1). To implement measures, supplier and industry collaboration is stressed. Collaboration can include providing access to third-party support and assisting suppliers to drive system change by co-developing projects (M12).

Ritter Sport stresses the importance of collaborating with the whole supply chain and its partners to achieve the goal of climate neutrality (P4, personal communication, 12.07.23). The CEO, Asmus Wolff, emphasises that suppliers should be supported to transform to climate neutrality by showing them ways to decarbonize their actions (Alfred Ritter GmbH & Co. KG, 2023d). Thus, pressure on suppliers increases to implement sustainability standards and work in collaboration with other actors in the supply chain. Some climate mitigation efforts are included in contractual agreements with suppliers and monitored by developing a target system within the procurement department (P4, personal communication, 12.07.23). In addition, Ritter Sport has yearly discussions on sustainability efforts with suppliers, stating that these conversations are of high importance to ask about the target progress and assist them when problems occur (P4, personal communication, 12.07.23).

At a farmer level, implications include a higher workload to implement the production requirements (P3, personal communication, 12.07.23). Chocolate manufacturers and traders highlight that specific farmer circumstances have to be considered when pursuing actions on a farmer level (ETG4, N4, H9). Climate mitigation efforts pilot and scaling programs can include financial support programs, technical assistance (on farming practices), technological support, and institutional support. Moreover, farmers can become a part of regular audits (H8, M7). In addition, traceability efforts can lead to technological inclusion through mobile phone applications for payments while also including information on farming practices (EC4). Besides, as new skills are required for agroforestry plantation, long-term engagements with smallholder farmers will be required for effective yields (H9).

Ritter Sport committed to purchasing 100% from farmer cooperatives and increasing sustainable efforts through contractual agreements (P4, personal communication, 12.07.23). These contracts vary depending on the farmer cooperatives' progress towards production standards but serve as a trigger for further actions (P4, personal communication, 12.07.23). Hence, Ritter Sport acknowledges that shifting a cooperative's preferred farming approach takes time as they first need to consider the economic viability of the actions. *El Cacao* can be used as an example to convince farmers that sustainability is economically feasible (P4, personal communication, 12.07.23).

4.4 Possible Impacts on the Livelihood of Smallholder Farmers

To cluster the results of the document analysis and interviews, the five capitals of the SLA approach are used, as changes within these capitals can lead to improved livelihoods of smallholder farmers in the Global South (Scoones, 1998), as introduced in Chapter 2.3.

4.4.1 Traceability

According to P2, companies want to ensure that farmers receive a living income, and through traceability systems, firms can monitor farm information by obtaining information on yields, production systems, and social factors, such as education provided to children. This knowledge thereby enables action at the appropriate farms. Moreover, payments provided through apps can increase the economic capital of smallholders (EC5) and counter the risk of farmers being unaware of participating in the carbon market or a sustainability program in a cooperative, as indicated by P3.

4.4.2 Climate Mitigation Strategies

The climate mitigation strategies introduced previously have a variety of impacts on smallholder farmers.

“I like agroforestry as an approach because it is not just something that helps companies make claims, but it is something that should, if done right, also help farmers.” P3, personal communication, 12.07.23

The deployment of agroforestry, as indicated previously, is an approach that has climate mitigation potential while benefitting smallholder livelihoods. All expert interviews were fond of agroforestry as an approach that, if implemented correctly, leads to carbon sequestration and various co-benefits, as discussed in Chapter 2.6. The chocolate company reports also mentioned the positive benefits. Especially an improvement in natural capital was highlighted through increasing organic soil matter, biodiversity, climate resilience and reducing the risk of crop diseases and fertilizer usage (P1, personal communication, 23.06.23, Appendix C). These benefits increase natural resource stocks and thus improve farmers' overall livelihood by making cocoa harvesting feasible in the long term. Moreover, agroforestry can enhance the resilience of cocoa cultivation and thereby smallholder farmers while ensuring the natural resource base (P1, personal communication, 23.06.23).

Furthermore, agroforestry can lead to livelihood diversification by selling different crops, thereby increasing the economic capital available to farmers and potentially reducing poverty (P1, personal communication, 23.06.23; P3, personal communication, 12.07.23). In addition, living standards can be improved, potentially reducing child labour and less migration to cities (H8). P1 states that adopting agroforestry practices is “a matter of education and awareness creation and building their capacities to get to a point where they are able to make certain

decisions for themselves.” (P1, personal communication, 23.07.23). Thus, deploying those strategies relies on increasing human capital through appropriate training and education undertaken by chocolate manufacturers and traders in cooperation with local actors. Besides income diversification through food, farmers can benefit by creating carbon credits on the voluntary carbon market (P1, personal communication, 23.07.23). Nevertheless, these additional benefits can be only seen as add-ons, underlined by the quote: “We cannot eat carbon” (P1, personal communication, 23.07.23).

P3 highlights that the adoption of climate mitigation approaches is a question of payment for the extra work of the farmers, as they are limited in resources and cocoa farming is only the most attractive out of unattractive choices, and farmers are often not sufficiently rewarded for the extra efforts (P3, personal communication, 12.07.23). In terms of physical capital, some agroforestry programmes provide tools to meet the production requirements (H8), enabling implementation. Furthermore, social capital might be impacted through collaboration approaches in adoption by connecting the local communities to resolve challenges or providing educational centres, bringing communities together (H8, C2).

Overall, based on the data collected, climate mitigation can positively impact smallholder farmer livelihoods, primarily by increasing natural and economic capitals and thereby reducing the vulnerability of the local communities. Nevertheless, besides the reported positive implications on the livelihood of these approaches, in reality, smallholder interests are often not taken into account sufficiently (P3, personal communication. 12.07.23).

Ritter Sports' impact on farmers can be seen mainly in Nicaragua, where its efforts have shown support for agroforestry practices and cooperatives since 1990. Moreover, the company promotes cocoa production exclusively in connection with the agroforestry system when cooperating with smallholder cooperatives in the country, improving cacao quality and increasing farmer income (Campos & Hütz-Adams, 2022). In addition, Ritter Sport promotes the adoption of agroforestry through multiple projects, pointing out the positive implications of endorsing those practices for smallholder farmers in their coca report (AR7). These mainly include increasing economic capital through diversification of income, composting for a cheaper alternative than chemical fertilizers, increasing natural capital, increasing biodiversity and higher climate change resilience, and increasing human capital through the provision of training (AR7; P4, personal communication, 12.07.23).

5. Discussion

This chapter aims to link the results (Chapter 4) with implications from theory (Chapter 2), addressing the research question of how the implementation of Scope-3 emissions reduction strategies by chocolate companies change the way they manage their cocoa supply chains and what impact could this have on smallholder cocoa farmers' livelihoods in the Global South.

Sub-question 1: What strategies are chocolate companies deploying to address Scope 3 emissions in their cocoa supply chains?

First, it was validated that chocolate firms commit to emission reduction through net zero target setting, zero deforestation pledges, sustainable sourcing targets and pledges to sourcing cocoa from agroforestry systems. As discussed in the literature, the traceability of cocoa can be seen as a prerequisite for enacting climate mitigation strategies. Acknowledging the complexity of the supply chain (Grabs & Carodenuto, 2021), firms committed to 100% traceability (H9, EC4). Increasing traceability requires action, such as polygon mapping, to determine deforestation risk. The additional transparency not only allows firms to tackle deforestation and enact other climate mitigation strategies but can increase social, ecological and operational performance (Bastian & Zentes, 2013).

The role of agroforestry in climate mitigation within the cocoa sector is critical, and companies are adopting implementation measures on a broader scale. Chocolate firm reports include various benefits of agroforestry systems, such as carbon sequestration, increased biodiversity and climate change resilience. Literature mainly supports these claims (Arimi & Omoare, 2021; Tscharrntke et al., 2011). Nevertheless, the results highlight that the impacts of agroforestry might be more complex than presented in the company reports. Blaser et al. (2018) support the possible benefits of the agroforestry system but state that trade-offs have to be taken into account between productivity and climate and sustainability goals when setting up agroforestry systems. One interviewee also raised this concern by stating that sustainability efforts are brought through already existing extension programs of the chocolate manufacturers, which focus mainly on productivity increases (P2, personal communication, 11.07.23). Moreover, the varying definitions of agroforestry of companies were highlighted as a challenge to determining the actual impacts of this approach by P3. This links to Ruf (2011) stating that low shade coverage agroforestry system might lead to the reduction of more biodiverse farming systems.

Sub-question 2: What do these strategies imply for the cocoa supply chain and smallholder cocoa farmers in the Global South?

Regarding the implementation of actions, informal and formal governance mechanisms are used, as indicated by Koberg and Longoni (2019). The case of Ritter Sports highlights that the company aims to make its supply chain more sustainable by contractual agreements with

binding targets and yearly stock takes on progress (P4, personal communication, 12.07.23). Thus, Ritter Sport collaborates and assesses its suppliers, as proposed within the supply chain management literature (Grimm et al., 2016). Moreover, Ritter Sport's farm *E/ Cacao* shows that sustainable cocoa production is economically feasible (P4, personal communication, 12.07.23). The company's finding is shared throughout the supply chain and can be used in communication to increase adoption rates. The results thereby show that companies are using a variety of supply chain management and governance strategies to implement climate mitigation along their supply chains.

Moreover, chocolate firms advocate for collective action, including collaboration with various stakeholders on the local, national and international levels. This highlights that chocolate firms understand the need for landscape approaches and collaboration to implement climate mitigation strategies, as indicated by Renier et al. (2023). Besides landscape approaches, the importance of area-specific actions within one company's supply chain was highlighted by interviewee P1. In addition, pre-competitive collaboration on a landscape emerged from one of the interviews (P3, personal communication, 12.07.23).

Sub-question 3: What are the direct and indirect impacts of these strategies on the livelihoods of smallholder farmers in the Global South?

Based on the data collection deploying climate mitigation strategies can positively impact smallholder farmers' livelihood, mainly by increasing natural and economic capital. Nevertheless, trade-offs in a company's strategy have to be considered before implementation with conflicting goals of increasing yields and adopting efficient climate mitigation strategies (P2, personal communication, 11.07.23, P3, personal communication, 12.07.23). Thus, research and pilot projects of firms can be highlighted as positive measures to ensure that local systems are considered, linking to the need for appropriate farmer engagement to ensure the effectiveness of actions (Codjoe et al., 2013).

The interviews indicated that aiming for compliance with the EU Regulation on deforestation-free products will be the priority for the cocoa supply chain in the upcoming years while bearing the risk of reducing the capacity of other support programs (P1, personal communication, 23.07.23, P3, personal communication, 12.07.23). This development could potentially harm the adoption rates of efforts to climate mitigation, as farmers need sufficient time and resources to implement more sustainable farming practices, such as agroforestry.

The research results validate the interactions shown in the conceptual framework, which was based on the literature review (Figure 3). A combination of landscape and area-specific approaches might be appropriate to address climate mitigation effectively, while the local context should be considered when setting up appropriate actions to ensure implementation

(Roe et al., 2019). Moreover, determining how smallholder livelihood is impacted by implementing climate mitigation strategies is crucial to identify possible reactions of smallholder farmers, thus mitigating the risk of ineffective strategies (Ameyaw et al., 2018; Codjoe et al., 2013). Overall, the research results validate the findings in the literature review while providing information on company strategies, their implication for supply chain and smallholder farmers and determining possible livelihood impacts.

6. Conclusion and Recommendations

6.1 Conclusion & Recommendations

Climate mitigation is crucial to stay within the planetary boundaries (Rockström et al., 2009). The impacts of climate change can already be witnessed through temperature records and strengthening weather extremes (IPCC, 2022). The complex cocoa supply chains are highly affected by climate change impacts, while emissions, mainly from land use change and land use, significantly contribute to climate change (Fountain & Hütz-Adams, 2022; Grabs & Carodenuto, 2021). Thus, chocolate manufacturers are deploying climate mitigation strategies in their supply chain, impacting smallholder farmers who account for approximately 80% of worldwide cocoa production (Camargo & Nhantumbo, 2016). As these are the most vulnerable actors within the supply chain, this research addressed the question which cocoa supply chain emission reduction strategies are deployed and how they can be implemented in the supply chain and impact smallholder farmers' livelihoods through pursuing a document analysis complemented by expert interviews and a case study for the purpose of illustration.

The literature review set the context for the research while highlighting the supply chain's complexity, introducing the concept of supply chain management and governance, and conceptualising a theoretical framework. Moreover, possible emission reduction strategies were identified (Chapter 2). Within the literature review, the importance of landscape approaches, and context-specific approaches, was highlighted, while emission reduction in the AFOLU can be conducted through forest protection and conservation, forest restoration, improving forest management and agroforestry, as well as improving agricultural practices (Anderson et al., 2022; Nabuurs et al., 2022; Roe et al., 2021).

The study confirms that chocolate companies are committed to reducing emissions through various strategies, including setting net-zero targets, zero deforestation pledges, and sustainable sourcing initiatives. Traceability is identified as a crucial prerequisite for effective climate mitigation strategies, with firms actively working towards 100% traceability. However, complexities arise from potential trade-offs between productivity and sustainability goals in climate mitigation efforts, emphasizing the need for context-specific approaches.

The research indicates that chocolate companies employ various supply chain governance and management mechanisms for implementing climate mitigation strategies. There is a strong focus on collaboration, while pre-competitive collaboration emerged as a potential strategy for effective climate mitigation. Furthermore, adopting a landscape approach entails considering the broader ecosystem and interconnections rather than focusing solely on one individual supply chain. This approach facilitates more systematic and comprehensive changes, essential for effectively mitigating emissions. (Chapter 4, Chapter 5).

Based on research findings, it can be determined that climate mitigation strategies can have positive impacts on smallholder farmers' livelihoods. They are often connected to livelihood benefits, such as income diversification, through the voluntary carbon market's inclusion and growing crops that can serve as an additional income source. Nevertheless, the findings highlighted that collaboration within the industry is crucial for the success of climate mitigation strategies (Chapter 4).

Moreover, this study's findings emphasise the importance of context-specific approaches and appropriate farmer engagement in ensuring the effectiveness of climate mitigation strategies. Addressing the complexities of trade-offs and providing sufficient support to smallholder farmers in adopting sustainable practices will be crucial for achieving meaningful and sustainable climate mitigation outcomes in the cocoa supply chain (Chapter 5).

Overall, the research contributed to the field of sustainable supply chain management and sustainability science by addressing the complex supply chain while highlighting possibilities of emission reduction strategies. The research helps understand the emission reduction strategies deployed while providing an overview of possible impacts on smallholder farmers. At the same time, the creation of the conceptual framework provides a lens considering vertical supply chain strategies and connecting them to the horizontal sustainable livelihoods approach to highlight the impacts of the strategies deployed on the livelihood of cocoa farmers.

6.2 Reflection on the Limitation

A critical limitation of this research is the broadness of the topic. It includes various concepts, approaches and stakeholders with different interests. In addition, emission reduction strategies by chocolate companies vary drastically based on the size, business model and ownership status of the company. Thus, a case study approach was valid for answering the research questions, but the data collection only partly allowed a deep dive into the case. Especially exploring the impacts of smallholder farmers should have been complemented by more primary data collection. The possibility of talking with smallholders at the farms would have provided significant improvements in determining the impacts on their livelihoods. Moreover, the concept of Scope 3 emissions and emission reduction strategies seem relatively new to the cocoa supply chains of chocolate firms, but climate mitigation strategies, such as deforestation efforts and agroforestry, have been discussed in previous studies; therefore, a focus on a specific strategy, such as the deployment of agroforestry and its potential benefits and challenges, would have been interesting and could have provided more detailed insights, especially on smallholder farmer impacts.

6.3 Recommendations for Further Research

One part of the thesis findings provided insights that smallholder farmers have to change their behaviour to implement land use change strategies for climate mitigation. This research suggests the further exploring possible incentives for behavioural change to ensure that smallholder farmers adopt climate mitigation strategies, as land use change activities are a major lever to global climate mitigation efforts. Moreover, collaboration within the industry could be researched in further detail, as companies call for collaborative approaches. This research could determine what modes of collaboration are the most effective in deploying climate mitigation strategies in cocoa supply chains. In addition, the question can be raised if it is in the economic interest of traders and chocolate manufacturers to change towards a more sustainable supply chain and implement effective climate mitigation strategies. The motivations for deploying those strategies could be further explored by assessing external and internal pressures on the companies. As the connection of the SLA with supply chain management provides a framework for impact measurement along the supply chain, including smallholder farmers or vulnerable people, additional research could test the robustness of this framework while using a different methodological approach.

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Appendix A – Analysed Documents

This Appendix entails a list of the analysed documents.

ID	Company	Document Title	Doc Type	Year	Source / Link	Accessed on
AR1	Alfred Ritter GmbH & Co. KG	Sustainability Report	Report	2020	https://irp.cdn-website.com/6cb74a62/files/uploaded/NHB_2020_kompakt_EN_148x148_einzel.pdf	07.07.23
AR2	Alfred Ritter GmbH & Co. KG	Unser Kakao	Website	n.d.	https://www.ritter-sport.com/de/unser_kakao	07.07.23
AR3	Alfred Ritter GmbH & Co. KG	Forum Nachhaltiger Kakao: Roadmap	Roadmap	2022	https://www.kakaoforum.de/fileadmin/Redaktion/Downloads/Interne_geschuetzte_Downloads/Monitoring/Roadmaps/Roadmap_Alfred_Ritter_final_1_.pdf	07.07.23
AR4	Alfred Ritter GmbH & Co. KG	Code of Conduct	Code of Conduct	2023	https://irp.cdn-website.com/6cb74a62/files/uploaded/2023_Code%20of%20Conduct_DE.pdf	07.07.23
AR5	Alfred Ritter GmbH & Co. KG	Cacao Commitment	Commitment	2023	https://irp.cdn-website.com/6cb74a62/files/uploaded/2023%20Commitment%20nachhaltigen%20Kakaoanbau.pdf	08.07.23
AR6	Alfred Ritter GmbH & Co. KG	Policy Statement	Policy	2023	https://irp.cdn-website.com/6cb74a62/files/uploaded/2023_Alfred%20Ritter%20GmbH%20Grundsatzerkla-rung_DE.pdf	08.07.23
AR7	Alfred Ritter GmbH & Co. KG	Kakaoreport 2023	Report	2023	https://irp.cdn-website.com/6cb74a62/files/uploaded/RS_Kakaoreport-23-1_DE.pdf	08.07.23
BG1	Beyond Good	Our Difference	Website	2022	https://beyondgood.com/pages/our-difference	07.07.23
C1	Cémoi	Sustainability Report 22/23	Report	2023	https://www.calameo.com/read/0072994793ae5af4f8fcd	08.07.23
C2	Cémoi	CFI Progress Report 2022	Report	2022	https://www.calameo.com/read/007299479bb437da60c8b?page=1	08.07.23

EC1	ECOM	Future for Cocoa	Website	n.d.	https://www.ecomtrading.com/products-services/cocoa/	10.07.23
EC2	ECOM	Ecom Cocoa Video	Video	2023	https://vimeo.com/831576078?share=copy	10.07.23
EC3	ECOM	Supply Chain Disclosure	Disclosure	2023	https://www.ecomtrading.com/media/heedbcgu/ecom-cfi-report-action-plan-2022-2023.pdf	10.07.23
EC4	ECOM	CFI Progress Report 2022 & 2023 Action Plan	Report	2023	https://www.ecomtrading.com/media/heedbcgu/ecom-cfi-report-action-plan-2022-2023.pdf	10.07.23
EC5	ECOM	Cocoa Sustainability Report 2023	Report	2023	https://www.ecomtrading.com/media/tuzifqew/ecom-cocoa-sustainability-report-2022.pdf	10.07.23
EC6	ECOM	Websites	Websites	n.d.	https://www.ecomtrading.com/products-services/cocoa#certifications-and-partnerships https://www.ecomtrading.com/sustainability/sustainable-approach/manage-traceability/ https://www.ecomtrading.com/sustainability/sustainable-approach/protect-nature/ https://www.ecomtrading.com/sustainability/sustainable-approach/improve-prosperity/	10.07.23
ETG 1	ETG-Beyond Beans	CFI Progress Report 2022	Report	2022	https://beyondbeans.org/wp-content/uploads/2023/06/CFI_Progress_Report_ETG-BB_2021-22.pdf	09.07.23
ETG 2	ETG-Beyond Beans	Publication Website	Website	n.d.	https://beyondbeans.org/publications/	09.07.23
ETG 3	ETG-Beyond Beans	Beyond Beans	Website	n.d.	https://beyondbeans.org/	09.07.23
ETG 4	ETG	Sustianability Report 2022	Report	2023	https://www.etgworld.com/assets/pdfs/ETG_Sustainability_Report_2022.pdf	09.07.23

ETG 5	ETG-Beyond Beans	Cocoaching	Report	n.d.	https://beyondbeans.org/wp-content/uploads/2023/05/Cocoaching_Individualised_Coaching.pdf	09.07.23
F1	Ferrero	Sustainability Report	Report	2021	https://www.ferrerosustainability.com/int/sites/ferrerosustainability_int/files/2022-07/ferrero_book_1307_interactive-compressed.pdf	07.07.23
F2	Ferrero	Supplier Code	Code of Conduct	2020	https://www.ferrerosustainability.com/int/sites/ferrerosustainability_int/files/2023-03/supplier_code_csr.pdf	07.07.23
F3	Ferrero	Cocoa Charter	Charter	n.d.	https://www.ferrerosustainability.com/int/sites/ferrerosustainability_int/files/2022-06/20220406-cocoa-charter-light.pdf	07.07.23
F4	Ferrero	Cocoa Action Plan	Report	n.d.	https://www.ferrerosustainability.com/int/sites/ferrerosustainability_int/files/2022-03/20220128_cocoa-actionplan-light.pdf	07.07.23
F5	Ferrero	Cocoa Progress Report 2020/2021	Report	2022	https://www.ferrerosustainability.com/int/sites/ferrerosustainability_int/files/2022-11/20220926-cocoa-progress-report_final-final.pdf	07.07.23
F6	Ferrero	CFI Action Plan 2022-2025	Report	2022	https://www.ferrerosustainability.com/int/sites/ferrerosustainability_int/files/2023-05/20230523-cfi-action-plan-light_0.pdf	07.07.23
F7	Ferrero	Forum Nachhaltiger Kakao: Roadmap	Roadmap	2022	https://www.kakaoforum.de/fileadmin/Redaktion/Downloads/Interne_geschuetzte_Downloads/Monitoring/Roadmaps/Roadmap_Ferrero_final.pdf	07.07.23
H1	Halba	Sustainability Report CO ₂ eq. Strategy	Website	2022	https://sustainabilityreport.halba.ch/en/2022.html	07.07.23
H10	Halba	Climate Protection Policy and Action Plan	Policy	2023	https://www.halba.ch/en/sustainability/policies.html	07.07.23
H11	Halba	Procurement Policy	Policy	2023	https://www.halba.ch/en/sustainability/policies.html	07.07.23
H12	Halba	CFI Action Plan	Report	2022	https://www.halba.ch/en/sustainability/policies.html	07.07.23
H2	Halba	Sustainability Report Critical Raw Materials	Website		https://sustainabilityreport.halba.ch/en/2022.html	07.07.23

H3	Halba	Sustainability Report Dynamic Agroforestry	Website		https://sustainabilityreport.halba.ch/en/2022.html	07.07.23
H4	Halba	Sustainability Report Energy Saving Measures	Website		https://sustainabilityreport.halba.ch/en/2022.html	07.07.23
H5	Halba	Sustainability Report Focus on Cocoa	Website		https://sustainabilityreport.halba.ch/en/2022.html	07.07.23
H6	Halba	Sustainability Report Outlook	Website		https://sustainabilityreport.halba.ch/en/2022.html	07.07.23
H7	Halba	Sustainability Report Quality Certification	Website		https://sustainabilityreport.halba.ch/en/2022.html	07.07.23
H8	Halba	Agroforestry Policy and Action Plan	Policy	2023	https://www.halba.ch/en/sustainability/policies.html	07.07.23
H9	Halba	Deforestation and Conversion Policy and Action Plan	Policy	2023	https://www.halba.ch/en/sustainability/policies.html	07.07.23
M1	Mars Wringley	Forum Nachhaltiger Kakao: Roadmap	Roadmap	2022	https://www.kakaoforum.de/fileadmin/Redaktion/Downloads/Interne_geschuetzte_Downloads/Monitoring/Roadmaps/Roadmap_MarsWringley_final.pdf	07.07.23
M10	Mars Wringley	Deforestation Policy	Website	n.d.	https://gbr.mars.com/about/policies-and-practices/deforestation-policy	10.07.23
M11	Mars Wringley	Supplier Code of Conduct	Website	n.d.	https://lhcdn.mars.com/adaptivemedia/rendition/id_3f05474894325de17155bd8fc7f27a414243305f/name_out/MARS_Code%20of%20Conduct%20-%20%20Column%20_V04%20-%20M%20(English).pdf	10.07.23
M12	Mars Wringley	Mars Next Generation Supplier Program	Website	n.d.	https://gbr.mars.com/about/policies-and-practices/next-generation-supplier-program	10.07.23

M13	Mars Wringley	Cocoa Forest and Action Plan	Website	n.d.	https://gbr.mars.com/about/policies-and-practices/cocoa-and-forests-policy	10.07.23
M14	Mars Wringley	CFI Report	Report	2021	https://lhcdn.mars.com/adaptivemedia/rendition/id_10af65cf34ba4f88a45195d64fdd085b3902101a/name_out/CFI%20-%20Mars%20Initial%20Action%20Plans%20Final_1.pdf	10.07.23
M2	Mars Wringley	Climate Action Position Statement	Website	2019	https://www.mars.com/about/policies-and-practices/climate-action	10.07.23
M3	Mars Wringley	Land Use Position Statement	Report	2019	https://lhcdn.mars.com/adaptivemedia/rendition/id_3a196d790b3286ffbeecfcd2c269f1c2697bbf01/name_out/Land%20Use%20Position%20Paper.pdf	10.07.23
M4	Mars Wringley	CDP Disclosure	Report	2022	https://www.mars.com/sites/g/files/jydpvr316/files/2023-02/CDP%20Climate%20Change%202022.pdf	10.07.23
M5	Mars Wringley	Cocoa for Generations	Report	2021	https://www.mars.com/sites/g/files/jydpvr316/files/2023-02/CDP%20Climate%20Change%202022.pdf	10.07.23
M6	Mars Wringley	Sustainable Cocoa Tomorrow	Website	n.d.	https://www.mars.com/sustainability-plan/cocoa-for-generations/sustainable-cocoa-tomorrow	10.07.23
M7	Mars Wringley	Saving Tomorrow's Cocoa, Today	Website	n.d.	https://gbr.mars.com/news-and-stories/articles/cocoa-farming-sustainability	10.07.23
M8	Mars Wringley	Healthy Planet	Website	n.d.	https://gbr.mars.com/sustainability-plan/healthy-planet	10.07.23
M9	Mars Wringley	Greening our Operations and Transforming Key Supply Chains	Website	n.d.	https://gbr.mars.com/news-and-stories/articles/mars-takes-climate-action	10.07.23
N/A	Fuchs & Hoffmann	Forum Nachhaltiger Kakao: Roadmap	Roadmap	2022	https://www.kakaoforum.de/fileadmin/Redaktion/Downloads/Interne_geschuetzte_Downloads/Monitoring/Roadmaps/Roadmap_Fuchs_Hoffmann_final.pdf	07.07.23
N1	Nestlé	Forum Nachhaltiger Kakao: Roadmap	Roadmap	2022	https://www.kakaoforum.de/fileadmin/Redaktion/Downloads/Interne_geschuetzte_Downloads/Monitoring/Roadmaps/Roadmap_Nestle_final.pdf	07.07.23

N10	Nestlé	Anual Cocoa Plan Progress Report 2021	Report	2022	https://www.nestlecocoaplan.com/sites/site.prod.nestlecocoaplan.com/files/2022-10/NEST7399_22_NCP-Progress-Report-2022_V19.pdf	08.07.23
N2	Nestlé	Sustainable Cocoa	Website	n.d.	https://www.nestle.com/sustainability/sustainable-sourcing/cocoa	08.07.23
N3	Nestlé	Towards Forest Positive Cocoa - Annual Progress Report	Report	2023	https://www.nestlecocoaplan.com/sites/site.prod.nestlecocoaplan.com/files/2022-04/Nestle%CC%81%20Towards%20Forest%20Positive%20Cocoa%20Report%202022%20.pdf	08.07.23
N4	Nestlé	CFI Action Plan	Report	2022	https://www.nestle.com/sites/default/files/asset-library/documents/library/documents/corporate_social_responsibility/cocoa-and-forests-initiative-nestle-initial-action-plan.pdf	08.07.23
N5	Nestlé	Responsible Sourcing Standard	Policy	2018	https://www.nestle.com/sites/default/files/asset-library/documents/library/documents/suppliers/nestle-responsible-sourcing-standard-english.pdf	08.07.23
N6	Nestlé	Net Zero Roadmap	Roadmap	2023	https://www.nestle.com/sites/default/files/2020-12/nestle-net-zero-roadmap-en.pdf	08.07.23
N7	Nestlé	Rural Development Framework	Policy	2015	https://www.nestle.com/sites/default/files/asset-library/documents/library/documents/corporate_social_responsibility/nestle-rural-development-framework-update2015.pdf	08.07.23
N8	Nestlé	Commitment on Deforestation and Forest Stewardship	Policy	2013	https://www.nestle.com/sites/default/files/asset-library/documents/library/documents/corporate_social_responsibility/commitment-on-deforestation-2013.pdf	08.07.23
N9	Nestlé	Direct Tier 1 Suppliers	Report	2020	https://www.nestle.com/sites/default/files/2019-09/supply-chain-disclosure-cocoa-plan-2019.pdf	08.07.23
OB1	Original Beans	Climate Forest Certificates	Report	n.d.	https://drive.google.com/file/d/1UW5m9l-pO-vi7F6LRTp7BTZqggQvNE7V/view	07.07.23
OB2	Original Beans	Regeneration Catalogue	Report	2021	https://drive.google.com/file/d/1aOxxKBBkTo22DRQbODPWgPv_Dt1sCRar/view#	07.07.23

OB3	Original Beans	Chocolate Footprint 2022	Website	n.d.	https://originalbeans.com/pages/chocolate-foodprint-2022	07.07.23
OB4	Original Beans	Your Impact	Website	n.d.	https://originalbeans.com/pages/your-impact	07.07.23
TC1	Tony chocolonely	Netflix Documentary "Rotten", S2E5	Documentary	2019	Netflix	07.07.23
TC2	Tony chocolonely	FAIR Report 2021-2022	Report	2022	https://tonyschocolonely.com/nl/en/annual-fair-reports/annual-fair-report-2021-2022	07.07.23
TC3	Tony chocolonely	5 sourcing principles	Website	2022	https://tonyschocolonely.com/nl/en/our-mission/serious-statements/tonys-5-sourcing-principles	07.07.23
TC4	Tony chocolonely	Deforestation in Cocoa	Website	n.d.	https://tonyschocolonely.com/nl/nl/deforestation-in-cocoa	07.07.23

Appendix B – Codes

This Appendix includes the code list for the document analysis (Table B1) and a shortened code list for the interview analysis (Table B2).

Table B1: Codes for Document analysis

Code Groups	Code
Adaptation and Sequestration	Carbon pricing
	Climate Adaptation Measure
	Climate Resilient Crops
	Forest Positive
	Insetting
	Offsetting
	Reforestation
	Sequestration
Collaboration Approach	Area-specific Collaboration Approach
	Landscape Collaboration Approach
	NGO Partnership
	Public sector Collaboration
	Public-Private Partnerships
	Theory of Change
	Third-party involvement
Commitment	Collective Commitment
	Company Pledge
Emissions	Greenhouse Gas Emission Measurement
	Scope 1
	Scope 2
	Scope 3
Implementation	Risk assessment, Reporting and Disclosure
	Smallholder engagement
Implementation, Operational Change	Internal Due Diligence Processes
Mitigation strategy	Agroforestry
	Bottom-up approach
	Carbon Neutral Beans
	Climate Smart Agriculture
	Crop Diversification

	Deforestation
	Demonstration Farm
	Footprint Reduction
	Forest Restoration
	Good Agricultural Practices
	Land Use Management
	Organic Farming
	Other Mitigation Strategies
	Payment for Ecosystem Services
	Preserve Forests
	Regeneration
	Renewable Energy on Farm Level
	Scope 3 Challenges
	Shade-grown Cacao
	Technology / Research
	Testing / Pilot
	Top-down approach
	Transport Mitigation Strategy
Monitoring & Evaluation	Compliance / Impact
	Monitoring
Operational Change	Key Performance Indicator
Policies	Procurement Standard / Sourcing
	Production Standard
Policies, Supply Chain	Supplier Code of Conduct (incl. Climate Mitigation)
Responsibility & Accountability	Responsibility / Accountability
Smallholder Impact	Economic Smallholder Impact
	Environmental Smallholder Impact
	Social Smallholder Impact
	Income diversification
	Livelihood
	Smallholder Cooperative Collaboration
	Smallholders
	Farmer Incentive

Sourcing	Direct Sourcing
	Employee training
	FairTrade
	Incentives (Sectoral Standard)
	Indirect Sourcing
	Rainforest Alliance
	Responsible Sourcing
	Sanctions (Sectoral Standard)
	Sustainable sourcing
	Unknown Sourcing
Supply Chain	Action to increase Productivity & Effectiveness
	Certification Standards
	Environmental Management System
	Formal Governance
	Informal Governance
	Investment
	Partnership
	Pre-competitive
	Regulation
	Sub-Suppliers
	Supplier Assessment
	Supplier Collaboration
	Supply Chain Transformation
	Supply Chain Transparency Measures
	Tier 1 Suppliers
Traceability	
Support Programs and capacity building	Financial Support Program
	Institutional Support Program
	Smallholder Support Programme
	Technical Support Program
	Technological Support Program

Table B2: Shortened interview coding list

RQ1: Strategies	Emission reduction
	Certification
	Agroforestry
	Solutions
	Challenges
	Landscape approach
	Area specific approach
	Deforestation
	Collaboration
	Traceability
	Insetting
	SBTi
	FairTrade
	Sustainable Programme
	Pilot projects
	Biochar
	Reforestation
	Commitment
	Trainings
Contracts	
RQ2: Implication on Supply Chain	Supplier
	Supply chain impact
	Smallholder farmer
	Partnerships
	Conversation
	Challenges
	Opportunities
RQ3: Smallholder impacts	Social capital
	Human capital
	Economic capital
	Natural capital
	Physical capital

Appendix C – Document Analysis

Table C1 includes the most relevant results from coding by company.

Cémoi		Source
Traceability & Transparency	<ul style="list-style-type: none"> • Commitment to Traceability; Prerequisite for implementing actions • 100% of cocoa mass traced to production • 100% of beans traced to cooperative • Polygon mapping in Côte d'Ivoire (85% in 2022) 	C1
Climate Mitigation	<p>Forest Protection & Restoration Efforts</p> <ul style="list-style-type: none"> • Commitment to Zero Deforestation by 2025 • Policy of responsible purchasing including combating deforestation <p>Improved Agricultural Practices</p> <ul style="list-style-type: none"> • Cocoa Support Projects, including farmer coaching through creation of educational centres, promoting sustainable agriculture (good yields and agroforestry) and rehabilitation of plots • Increasing yield per farm to reduce deforestation risk <p>Improved Forest Management & Agroforestry</p> <ul style="list-style-type: none"> • Partnerships to develop better agricultural systems (to combat deforestation, pest damage, increase yield and change farmer life) • Setting up KPIs to measure progress on agroforestry deployment <p>Other</p> <ul style="list-style-type: none"> • CFI Member • Commitment to Carbon Neutrality (without date) 	C1, C2
Supply Chain & Partnerships	<ul style="list-style-type: none"> • Supplier Code of Conduct • Risk Analysis • Partnerships within projects 	C1, C2
Smallholder Livelihood changes through Mitigation Efforts	<p>Natural capital</p> <ul style="list-style-type: none"> • Agroforestry, strengthening environmental conversation <p>Human capital</p> <ul style="list-style-type: none"> • Knowledge increase through trainings <p>Economic capital</p> <ul style="list-style-type: none"> • Agroforestry increases farmers income through higher yield and revenue diversification <p>Social capital:</p>	C1, C2

	<ul style="list-style-type: none"> Educational centres provide health service access and educational support, bringing communities together <p>Physical capital</p> <ul style="list-style-type: none"> N/A 	
ECOM		
Traceability & Transparency	<ul style="list-style-type: none"> Commitment to Traceability and transparency (100% origin-source cocoa by 2025) GIS mapping Publishing direct sourcing supply chain actors 	EC3, EC4 EC5,
Climate Mitigation	<p>Forest Protection & Restoration Efforts</p> <ul style="list-style-type: none"> Deforestation risk assessment to prioritize activities Research on LUC activities (data modelling pilots) Ensure zero deforestation Off-farm restoration projects through Payment for Ecosystem Services (PES) Ghana project (with Hershey's): min. 25 non-cocoa trees per ha to promote restoration connected to PES <p>Improved Agricultural Practices</p> <ul style="list-style-type: none"> Cocoa Support Projects Researching fertiliser alternatives and regenerative methods, such as mulching and composting Good Agricultural Practices (GAP) for yield improvement (to reduce emissions by growing cocoa on less land) Training in Climate Smart Agriculture for Farmers <p>Improved Forest Management & Agroforestry</p> <ul style="list-style-type: none"> Scaling up initiatives on regenerative agriculture (including agroforestry) Establish Agroforestry models in 100% of origin-sourced supply chains by 2023 Commitment of 100% Farmer training by 2025 in supply chain parts identified as having high risks of negative climate change effects (Adaptation) <p>Other</p> <ul style="list-style-type: none"> SBTi Net Zero Commitment by 2050 AFOLU emission reduction target: -33% by 2030 Advocate for creation of cocoa carbon accounting standard; ECOM wants to collect more farm level data Production Standard: Environmental Policy <p>Mitigation strategies until 2030:</p> <ul style="list-style-type: none"> Forest/trees (-39% of emissions) <ul style="list-style-type: none"> Direct trade/Traceability 	EC1, EC2, EC3, EC4, EC5, EC6

	<ul style="list-style-type: none"> ○ Ensure zero deforestation ○ Incentivise farmers through PES ○ Agroforestry ○ Landscape restoration and deployment ● Husk management (-1%) <ul style="list-style-type: none"> ○ Vermiculture compost, Biochar, soil carbon accumulation from composting, reduced waste on field ● Agriculture (-1%) <ul style="list-style-type: none"> ○ Yield improvement and GAP, Low carbon fertilisers, biobased fertilizers ○ Increase cocoa tree density ○ N-fixing bacteria ○ Early micro-grafting in nursery ○ New cocoa plantation on degraded land 	
Supply Chain & Partnerships	<ul style="list-style-type: none"> ● Commitment to responsible sourcing ● Large-scale agroforestry and afforestation need close collaboration between all supply chain stakeholders ● Collaboration with farmers and suppliers to find new solutions ● Phone app pilot for farmers in Ghana for transparent and safe payments and communicate information on maximising efficiency ● Part of Nestlé Income Accelerator Programme, which provides additional income sources for e.g. implementation of XY 	EC5, EC4
Smallholder Livelihood changes through Mitigation Efforts	<p>Natural capital</p> <ul style="list-style-type: none"> ● Regenerative agriculture: Increase in organic soil matter, biodiversity <p>Human capital</p> <ul style="list-style-type: none"> ● Good Agricultural Practices trainings increase technical assistance ● Farmer training in organic agroforestry (Programme specific) <p>Economic capital</p> <ul style="list-style-type: none"> ● Safe payments through app payment ● Payment for Ecosystem Services when farmers preserve rainforest (Pilot) ● Promotion of regenerative farming: encouragement for crop diversification for additional income streams <p>Social capital:</p> <ul style="list-style-type: none"> ● N/A <p>Physical capital</p> <ul style="list-style-type: none"> ● N/A 	EC4, EC5
ETG / Beyond Beans		
Traceability & Transparency	<ul style="list-style-type: none"> ● Supply chain mapping for improved traceability 	ETG4

	<ul style="list-style-type: none"> Traceability through digital payments, as most systems of certifications are paper based 	
Climate Mitigation	<p>Forest Protection & Restoration Efforts</p> <ul style="list-style-type: none"> Deforestation risk assessment to prioritize activities Community involvement critical Provision of Shade tree seedlings Project: Cookstoves reduce risk of deforestation as they reduce biofuel <p>Improved Agricultural Practices</p> <ul style="list-style-type: none"> Payment for Ecosystem Services approach where farmers receive fertilisers to increase productivity in other parts of farmland (ASASE), Development of local composter (fertilizing soil and sequestering carbon) <p>Improved Forest Management & Agroforestry</p> <ul style="list-style-type: none"> “Cocoaching and Agroforestry” through ASASE as bottom up approach, leading to development of agroforestry systems (e.g. first year 7 additional trees with aim of 20 in the following, while also increasing species) through a development plan, including annual visits <ul style="list-style-type: none"> Assisting farmers in receiving tree ownership for trees <p>Other</p> <ul style="list-style-type: none"> CFI member No Climate Neutrality target, but working with experts (also on determining Scope 3 Emissions) Establishment of Climate Desk to connect smallholders to the carbon market; Introduction of “carbon farming” 	ETG1, ETG2, ETG3, ETG4, ETG5
Supply Chain & Partnerships	<ul style="list-style-type: none"> Landscape approach pilot project ASASE to build climate resilience including 3000 farmers (focusing on agroforestry reforestation, aiming for a bottom-up approach that benefits farmers) Developing public-private collaborations Focus on farmer specific approaches and not one-size fits all approach <ul style="list-style-type: none"> Let farmers choose between 5 different agroforestry models Assisting establishment of community Resource Management committees as part of ASASE 	ETG1, ETG4, ET5
Smallholder Livelihood changes through Mitigation Efforts	<p>Natural capital</p> <ul style="list-style-type: none"> Cookstoves: Improve air quality Tree ownership <p>Human capital</p> <ul style="list-style-type: none"> Trainings increase knowledge and skills <p>Economic capital</p>	ETG1, ETG2, ETG4

	<ul style="list-style-type: none"> • Compost more cost effective than other market alternatives • “Carbon farming” as additional revenue stream • Income diversification through Cocoa juice made from pods <p>Social capital:</p> <ul style="list-style-type: none"> • Carbon farming has significant community benefits <p>Physical capital</p> <ul style="list-style-type: none"> • Provision of compost machines for pilots • Project: Cookstoves (reduce time spent collecting wood) 	
Ferrero		
Traceability & Transparency	<ul style="list-style-type: none"> • Commitment to 100% traceability to farm level • Publishing Tier-1 suppliers and farmer groups 	F1, F3
Climate Mitigation	<p>Forest Protection & Restoration Efforts</p> <ul style="list-style-type: none"> • Working towards ending deforestation in Ghana and Côte d’Ivoire as part of the CFI • Satellite monitoring and Farm Audits • Procurement Policy including no Deforestation <p>Improved Agricultural Practices</p> <ul style="list-style-type: none"> • Support farmers to increase productivity and diversify income <p>Improved Forest Management & Agroforestry</p> <ul style="list-style-type: none"> • Commitment to cocoa production that preserves environment and becomes best practices to agroforestry systems • Measuring agroforestry adoption, through hectares, trainings, etc.; Targets for adoption as part of CFI <p>Other</p> <ul style="list-style-type: none"> • CFI member • Reduce Scope 1, 2 and 3 emission intensity by 43% from 2018 baseline until 2030 • Cocoa Platform to gain supply chain visibility for risk assessment and compliance • 100% sourcing through certification and independently managed standards • Cocoa Action Plan: focus on productivity, financial support to halt deforestation: land-use planning, reducing forest pressure, local, national and international collaboration 	F1, F3, F4, F5, F6
Supply Chain & Partnerships	<ul style="list-style-type: none"> • Responsible sourcing • Collaboration needed to solve those complex issues • Key aspects to farmer prosperity: land tenure policies, targeted land-use planning, reducing forest 	F1, F2

	<p>pressure, ensuring collaboration at local, national and international level</p> <ul style="list-style-type: none"> • Supplier Code of Conduct: “Suppliers shall take appropriate steps to minimize air emissions”; “Supplies shall actively engage in supply chain to increase transparency and traceability” 	
Smallholder Livelihood changes through Mitigation Efforts	<p>Natural capital</p> <ul style="list-style-type: none"> • Deforestation threatens natural capital affecting livelihood negatively • Agroforestry systems make farmers more climate resilient <p>Human capital</p> <ul style="list-style-type: none"> • Trainings on climate-smart farming <p>Economic capital</p> <ul style="list-style-type: none"> • Diversification of income, e.g. project with ETG on Juice form Pulps • Payment for Environmental Services <p>Social capital:</p> <ul style="list-style-type: none"> • N/A <p>Physical capital</p> <ul style="list-style-type: none"> • N/A 	F1, F5
Halba		
Traceability & Transparency	<ul style="list-style-type: none"> • Polygon mapping: Different status in sourcing regions, but target of legally verified 100% polygon mapping by 2024 	H9
Climate Mitigation	<p>Forest Protection & Restoration Efforts</p> <ul style="list-style-type: none"> • Planting native tree species (Reforestation); CO₂ stored is certified and certificates are purchased by HALBA (Insetting) • Commitment to Deforestation free supply chain by 2025 (cut-off 2018) • Deforestation risk assessment: Polygon mapping and overlay with official protected forest map • <p>Improved Agricultural Practices</p> <ul style="list-style-type: none"> • Provision of tools for implementation of DAF <p>Improved Forest Management & Agroforestry</p> <ul style="list-style-type: none"> • Agroforestry Policy: <ul style="list-style-type: none"> ○ Definition of “Dynamic Agroforestry” ○ External review on implementation of policy ○ Intensive farmer training; Support with plants and tools for implementation ○ Landscape approach taken ○ 2040: 50% dynamic agroforestry (DAF) sourcing; 2030: 20% DAF sourcing 	H1, H3, H6, H8, H9, H10, H11

	<ul style="list-style-type: none"> ○ Gold Standard “insetting” through sequestered carbon of DAF <p>Other</p> <ul style="list-style-type: none"> • CFI member • Net zero 2050 target; Joined SBTi with potential target by the end of 2023 • Policies on Agroforestry, Climate Protection, Deforestation and Procurement • Internal Due Diligence: Risk assessments 	
Supply Chain & Partnerships	<ul style="list-style-type: none"> • 100% Fairtrade certified cocoa (clearly defined requirements regarding preservation forest protection and biodiversity) • Farmer audits through Fairtrade (internal and external reviews); Exclusion of farmers that do not meet requirements • Collaboration on projects with different partners through e.g. CFI • Long-term DAF projects, so farmers can develop relevant skills of implementation for it to be effective (pruning); Well trained farmers can become trainers 	H1, H9
Smallholder Livelihood changes through Mitigation Efforts	<p>Natural capital</p> <ul style="list-style-type: none"> • DAF mirrors rainforest; Organic matter becomes natural fertilizer • DAF also good for climate mitigation, keeping more water <p>Human capital</p> <ul style="list-style-type: none"> • Knowledge development trough DAF <p>Economic capital</p> <ul style="list-style-type: none"> • Additional payment for implementation • Reducing fertilizer usage • Improved soil fertility leads to doubling productivity in long term • Additional food source, increasing resilience • Timber trees as potential retirement provision (sold after 30 years) • DAF increase living standard through agricultural development (less child labour, malnutrition and migration) <p>Social capital:</p> <ul style="list-style-type: none"> • DAF projects connect multiple stakeholder groups, including focus on community platform to resolve local challenges • DAF is supposed to provide a higher incentive to younger farmers and improve gender equality <p>Physical capital</p> <ul style="list-style-type: none"> • Tools for implementation of DAF 	H3, H8, H12
Mars		

Traceability & Transparency	<ul style="list-style-type: none"> • 100% traceable coco from farm to first point of purchase • Disclosure on country of origin and Tier 1 suppliers (working on Tier 2, Tier 3 and farmer groups traceability) • Farms that are part of Responsible Cocoa Programme should be expected to use polygon mapping by 2025 	M1, M5, M7
Climate Mitigation	<p>Forest Protection & Restoration Efforts</p> <ul style="list-style-type: none"> • Pilot projects on Deforestation (As landscape approach is missing) in collaboration with other partners • Aim: Deforestation free supply chain by 2025 • Deforestation risk assessment • Farmer training on forest protection • Sourcing guidelines <p>Improved Agricultural Practices</p> <ul style="list-style-type: none"> • Research projects on improved productivity • Promoting efficient use of inputs (fertilizers and pesticides) • By 2030 deploying climate-smart agriculture across farming programs and partnerships • Farmer trainings on agroforestry techniques <p>Improved Forest Management & Agroforestry</p> <ul style="list-style-type: none"> • Research projects / Pilots to provide tailor made solutions for each farm and test climate-smart agriculture systems • Advancing Cocoa Agroforestry Towards Income Value and Environment (ACTIVE) pilot • Testing of crop diversification with increasing farmer income as main priority but also increasing sequestration capacity <p>Other</p> <ul style="list-style-type: none"> • CFI member • Science-based target: Net Zero 2050; -27% by 2025 (baseline 2015) • Transition from fossil fuel power to solar and renewables • “Responsible Cocoa Programme” 	M1, M4, M5, M7, M9, M10, M13, M14
Supply Chain & Partnerships	<ul style="list-style-type: none"> • Suppliers asked to report on commitments • Investments in largescale projects (Livelihoods Fund for Family Living (L3F)) • Commitment toward landscape level approaches to enhance agroforestry, working with suppliers; Landscape as critical component to move towards deforestation-free supply chains 	M1, M2, M3, M4, M5, M6, M9, M12

	<ul style="list-style-type: none"> • Private-public collaboration (relying on stricter regulation for deforestation free supply chains) • Collaboration on improving accounting measures, addressing deforestation and preserve forests with other industry actors • General short-term supply chain actions: improve raw material production practices; Change country of origin; replace raw material sourced • Supplier Code of Conduct: Includes stopping deforestation from specific cut-offdate • Financial support for smallholders by providing access to finance • “Pre-competitive” collaboration with peers and suppliers to accelerate learning via industry forums • Establishing rectifying instances • Supplier Audits (Assessment) through EcoVadis • Encourage supplier to take sustainability action on their own • Supplier Collaboration Model: Provide access to third party support, technology access and engage with workers to help suppliers to drive system change 	
Smallholder Livelihood changes through Mitigation Efforts	<p>Natural capital</p> <ul style="list-style-type: none"> • Increase biodiversity through agroforestry <p>Human capital</p> <ul style="list-style-type: none"> • Trainings increase farmer knowledge <p>Economic capital</p> <ul style="list-style-type: none"> • ACTIVE: increase income by up to 15% • Pilots can increase productivity and thus lead to higher income • Agroforestry: Stabilizing yields • Improving access to finance as part of programmes <p>Social capital:</p> <ul style="list-style-type: none"> • <p>Physical capital</p> <ul style="list-style-type: none"> • 	M1, M4, M5
Nestlé		
Traceability & Transparency	<ul style="list-style-type: none"> • Fully segregated traceability by 2027 • List of Suppliers published 	N1, N9
Climate Mitigation	<p>Forest Protection & Restoration Efforts</p> <ul style="list-style-type: none"> • “Forest Positive” Strategy • Detailed mapping of supply chain • Commitment to deforestation-free commodities until 2020 through certification, supply chain mappings, satellite images and landscape initiatives; Goal changed to 2025 • Improved cookstoves to reduce pressure on forests • Deforestation Risk Assessments (in Latin America) 	N1, N2, N3, N4, N5, N6, N8, N10

	<ul style="list-style-type: none"> Investments in protecting and restoring Forests <p>Improved Agricultural Practices</p> <ul style="list-style-type: none"> Efforts to increase productivity and efficiency through training in good agricultural practices <p>Improved Forest Management & Agroforestry</p> <ul style="list-style-type: none"> Encourage Agroforestry in West Africa <p>Other</p> <ul style="list-style-type: none"> Net Zero 2050 100% sourcing through Nestlé Cocoa Plan (Rainforest Alliance certified of verified independently) by 2025 100% certified sustainable cocoa by 2025 Income Accelerator Initiative (Pilot): Cash incentive with support in: agroforestry, productivity, child education and additional incomes CFI member 	
Supply Chain & Partnerships	<ul style="list-style-type: none"> Local context important to tackle deforestation Suppliers should report continuous improvement against supply chain standards Complex addressing deforestation: Livelihood needs to be considered: Collaboration essential Land Tenure: Difficult and sometimes based on country processes that can only be solved by governments and thus makes a global approach difficult (supported by Nestlé on local levels) Working with the Rainforest Alliance Responsible Sourcing Standards, including requirement to not produced on High Conservation Values 	N4, N5, N7
Smallholder Livelihood changes through Mitigation Efforts	<p>Natural capital</p> <ul style="list-style-type: none"> Agroforestry: Forest and fruit trees provide shade: helping to survive longer in dry seasons; benefits to soil; reduced risk of crop diseases <p>Human capital</p> <ul style="list-style-type: none"> Training <p>Economic capital</p> <ul style="list-style-type: none"> Agroforestry: Additional income sources for farmers through fruit and forest trees Link between poverty and deforestation: improving farmer income Financial incentives encouraging more sustainable practice through Income Accelerator Programme <p>Social capital:</p> <ul style="list-style-type: none"> <p>Physical capital</p> <ul style="list-style-type: none"> Cookstoves 	N2, N3

Original Beans		
Traceability & Transparency	<ul style="list-style-type: none"> 100% traceability due to direct sourcing and sourcing in remote rainforests (“single-origin” chocolate) 	OB3
Climate Mitigation	<p>Forest Protection & Restoration Efforts</p> <ul style="list-style-type: none"> One4One Tree Programme on reforestation Making tee growers tree owners through conservational payments to increase survival rate of newborn trees Independently direct forest protection agreements with farmers <p>Improved Agricultural Practices</p> <ul style="list-style-type: none"> Boosting women farmers yields leads to less forest loss <p>Improved Forest Management & Agroforestry</p> <ul style="list-style-type: none"> 100% grown in regenerative agroforestry systems <p>Other</p> <ul style="list-style-type: none"> Cocoa forest absorb all emissions created along the supply chain 	OB1, OB2, OB3, OB4
Supply Chain & Partnerships	<ul style="list-style-type: none"> Growing in partnerships with cocoa growers Indigenous empowerment Separate transport of OB beans due to organic sourcing 	OB2
Smallholder Livelihood changes through Mitigation Efforts	<p>Natural capital</p> <ul style="list-style-type: none"> Natural capital is kept / restored <p>Economic capital</p> <ul style="list-style-type: none"> Food provided for farmers 	OB2
Tony's Choclonely		
Traceability & Transparency	<ul style="list-style-type: none"> 100% traceability achieved (GPS mapping) Splitting of beans 	TC1, TC2
Climate Mitigation	<p>Forest Protection & Restoration Efforts</p> <ul style="list-style-type: none"> No cocoa connected to protected areas (Satellite data analysis) No cocoa on protected land -> if yes then support farmer to implement agroforestry and/or move to other lands to prevent further deforestation <p>Improved Agricultural Practices</p>	TC2, TC4

	<ul style="list-style-type: none"> Want to improve yields within existing farm sizes through “Good agricultural practices” <p>Improved Forest Management & Agroforestry</p> <ul style="list-style-type: none"> Knowledge raising Agroforestry programs (planting shade trees) <p>Other</p> <ul style="list-style-type: none"> Offsetting all emissions Shipping ran on biofuel 6 stages of due diligence 	
Supply Chain & Partnerships	<ul style="list-style-type: none"> Collaboration with Barry Callebaut to separate the beans from others in grinding processes 	TC1
Smallholder Livelihood changes through Mitigation Efforts	<p>Economic capital</p> <ul style="list-style-type: none"> Training increases yields and farmer income <p>Relatively little data available publicly on climate mitigation from Tony’s as the focus of the company is more on the social side of sustainability.</p>	TC2