Cocoa agroforestry in West Africa

Experiences from the private sector and opportunities for collaborative action

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Colophon

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Abbreviations

COCOBOD	Ghana Cocoa Board
CREMA	Community Resource Management Area
CRMC	Community Resource Management Committee
CSO	Civil Society Organization
CSSVD	Cocoa Swollen Shoot Virus Disease
DAF	Dynamic Agroforestry
ETG	Export Trading Group
FBO	Farmer-based organization
FDP	Farmer Development Plan
FMNR	Farmer managed natural regeneration
GAP	Good agricultural practice
GISCO	German Initiative on Sustainable Cocoa
ha	Hectare
ISCO	Initiative on Sustainable Cocoa
PES	Payments for ecosystem services
SLA	Sustainable Livelihood Approach
SLF	Sustainable Livelihood Framework
TiCA	Timber in Cocoa Agroforestry
VSLA	Village Savings and Loan Association
WCF	World Cocoa Foundation

Executive summary

Agroforestry has gained a lot of attention in the cocoa sector in recent years and has started to be integrated in national and international cocoa initiatives and company sustainability programmes. It is seen as a system that can provide multiple benefits, including sustainable cocoa production in the face of climate change, increasing the resilience of farmer livelihoods, and contributing to climate change mitigation and biodiversity conservation. However, despite these commitments, the adoption of cocoa agroforestry appears to be lagging and large areas remain under monoculture cultivation.

This is a report on a study by Tropenbos International, Tropenbos Ghana and Nitidae on the role of the private sector in promoting cocoa agroforestry in Ghana and Côte d'Ivoire. To gain insight into the strategies used by these companies this report therefore aims to achieve these goals:

- document the strategies of, challenges to and lessons learned by cocoa and chocolate companies in order to better understand what they are doing and why;
- provide recommendations to companies to improve their agroforestry promotion strategies, based on research findings about factors that influence agroforestry adoption and on lessons from their peers; and
- provide recommendations to the cocoa sector as a whole, building on the lessons from the companies and a literature review regarding the enabling environment for agroforestry adoption.

The report is structured around the case studies of six cocoa and chocolate companies and the different strategies they use to promote the adoption and scaling of agroforestry in Ghana and Côte d'Ivoire. The case studies are based on interviews with company representatives and on secondary data. The reports of the case studies are found in Annexes 1–6 of this report.

Adoption factors

To guide the analysis of company strategies and help formulate recommendations, the project mapped the factors that influence the adoption of agroforestry, based on a literature review. This overview — which is structured around internal and external factors — builds on the sustainable rural livelihoods framework of the Institute of Development Studies (Scoones 1998: 4) and the sustainable livelihoods framework of the Department for International Development (DFID 1999: 3). See Figure 2, page 16).

The internal factors that influence adoption include the five livelihood assets of the farming household: human, social, financial, physical and natural. These livelihood assets are influenced by external factors such as risks, shocks, trends and seasonality, as well as the social, political and macroeconomic context. The livelihood assets, combined with agroforestry features, influence the decision-making process at the household level on whether to adopt agroforestry. This process is shaped by the perceptions and attitudes of various household members, and by intra-household dynamics. Ultimately, their decision will have an impact on their livelihood assets and on the wider landscape.

Company strategies to promote agroforestry

The six agroforestry case studies provide insights into the companies' definitions of and ambitions for agroforestry, and into their agroforestry strategies, including challenges and lessons learned. Table 1 shows the agroforestry models that companies follow in the case study.

It is important to note that most of the case studies describe specific agroforestry projects, sometimes with support from public funding, and therefore do not represent what is being done across the supply chains of these companies. Only the case studies of Tony's Chocolonely and CÉMOI cover the agroforestry programmes across their supply chains.

Table 1. Agroforestry model followed by each company

Company	Agroforestry model used in the case study
Cargill	Three different planting models: 1) boundary, 2) intercropping, 3) full reforestation; models 1 and 2 use approximately 100 trees per hectare (ha)
CÉMOI	Five different planting models: 1) inside the farm, 2) around the farm, 3) trees inside and around the farm, 4) alternating strips, and 5) micro-forest; tree density ranges from 18 to 70 trees per ha for models 1–4
ETG | Beyond Beans	Standard systems are minimum 20 trees per ha, at least 3 different species, and 5 planting models. More advanced systems are 60+ trees per ha
HALBA	Dynamic agroforestry (DAF); a mature farm may have more than 300 trees of more than 20 different tree species per ha
Tony's Chocolonely	18 shade trees per ha, of at least 6 different tree species, and to achieve approximately 30% shade cover
Touton	Timber in Cocoa Agroforestry (TiCA) model: 80 trees per ha for maximum 40% shade

Companies tend to focus on strengthening farmers' assets, and on providing direct incentives for the adoption of agroforestry practices. A common starting point is investing in **human capital** and **social capital** through sensitization and building farmers' capacity to adopt agroforestry practices, via awareness-raising, training and coaching, and providing labour and services. The company cases highlight the importance of well-functioning cooperatives and community-based organizations to support these processes. The cases also show how gender-sensitive outreach helps to promote adoption by female farmers.

To address **financial capital**, companies often cover direct costs such as setting up nurseries, or provide seedlings and/or labour. Some companies support households with access to savings and loans, strengthen financial management skills and provide planning tools. Increasingly, there is interest in providing farmers with financial incentives through payments for ecosystem services (PES), price premiums or higher prices. Although financial incentives may be too small to make a significant change in financial capital of the household, they do turn out to be important in persuading farmers to shift from conventional practices to agroforestry and in allowing households to experience some of the benefits of agroforestry. However, financial incentives are also costly and difficult to scale.

In addition, companies invest in farmers' **physical capital** by increasing access to shade tree seedlings, either providing them for free or by means of nurseries, which are sometimes managed by women. The cost to establish the nursery is often covered by the company. Turning nurseries into viable businesses remains challenging, however, particularly if farmers are not willing to pay for seedlings. Another challenge is the lack of markets for agroforestry products; also, those markets that do exist may be a long distance away, or may impose quality standards that farmers cannot meet or volumes that they cannot deliver. The company cases show how they support cooperatives in developing market studies and establishing market linkages; for example, with timber companies.

Some companies work on protecting existing shade trees on farms and promoting natural regeneration, which is part of the **natural capital** of a cocoa household. Other companies invest in measures that complement agroforestry, such as effective composting to improve soil fertility. A crucial factor that constrains agroforestry adoption is lack of land and tree ownership and insecure tenure. This is why several companies invest in documentation of land and tree tenure as part of their agroforestry strategy. However, doing so is expensive and complex, and the need for partnerships and government interventions remains key.

Recommendations to companies

Some companies reported on cases that are part of specific projects; others applied these agroforestry strategies more broadly, in some cases across their supply chain. All six projects combine multiple measures, going beyond the simple distribution of tree seedlings, and taking into consideration the many factors that influence agroforestry adoption. Almost all companies promote shade levels or tree numbers that are significantly higher than those recommended by national government agencies in Ghana and Côte d'Ivoire.

The case studies indicate several areas where agroforestry could be further strengthened:

- Develop more tailored approaches to agroforestry promotion. The overview presented in this report (Figure 2) may provide a valuable starting point for developing a segmentation approach to agroforestry promotion.
- Include farmer managed natural regeneration of trees and maintain existing trees on farms, instead of focusing only on seedling distribution.
- Consider markets for agroforestry products from the start, explore the possibility of cooperatives as aggregators and marketers of these products, and establish partnerships with organizations and local businesses that can help strengthen market linkages.
- Link agroforestry programmes with those on gender, to help integrate the necessary gender perspectives and expertise into agroforestry interventions.
- Pay more attention to the business potential for shade tree and companion tree nurseries, or find alternative long-term funding structures for this service.
- Explore ways to increase the immediate benefits of agroforestry and make it easier to adopt. The agroforestry features presented in Figure 2 — relative advantage, compatibility, complexity, trialability and observability — can guide these actions.
- Support cooperatives in strengthening their role in agroforestry promotion and support among their members in a sustainable manner, beyond the duration of projects.
- Continue to share lessons, challenges and failures regarding agroforestry, with the aim of learning from each other and strengthening agroforestry programmes, including those of government extension agencies.
- Share key information about ongoing agroforestry programmes, to assess the extent to which they reach various areas and farmer groups, to identify gaps and prevent overlap within landscapes.

Recommendations to the sector

Under these approaches, agroforestry is promoted mostly through siloed projects of companies, which are limited in their ability to scale up. To achieve the adoption of agroforestry at scale and to reach its full potential in contributing to resilient landscapes, livelihoods and cocoa supply chains, it is important for all actors to rally behind a vision for agroforestry and work together to achieve it. Such a collaboration would provide an opportunity to reframe agroforestry as a locally owned solution, and to take a farmer-centric approach.

Two efforts could be explored at the landscape and national level to further strengthen collective action on agroforestry: the establishment of landscape-level agroforestry partnerships; and the development of a national agroforestry policy or strategy.

A partnership could encourage stakeholders to work together at the landscape level, combining efforts and resources, looking beyond individual supply chains and including off-farm areas that might benefit from restoration. It will be important to bring together the knowledge and resources of a range of stakeholders, paying specific attention to the expertise and preferences of farmers. In landscape partnerships where farmers, NGOs and public and private actors work together, companies could target all farmers in the landscape with an interest in agroforestry, not just those in their direct supply chains. This non-competitive collaboration could lead to joint assessments, learning and data collection (e.g., for restoration opportunities in the landscape and climate vulnerability assessments), as well as joint activities such as nursery establishment and training for farmers.

A national agroforestry policy or strategy that brings together different government departments can help to eliminate legal and regulatory restraints, enable alignment of efforts, and create the necessary incentives that reward farmers for the public benefits of agroforestry. The joint development and implementation of such a national measure — with all key actors, and with a focus on farmers and communities — can better align stakeholder efforts and ensure that they are shaped by the needs and rights of cocoa farmers and communities. The policy or strategy could guide coordinated efforts at the national level, such as creating an enabling regulatory context (e.g., strengthened forest law enforcement; addressing land and tree tenure), exploring joint financing options (e.g., climate finance) and guiding research, monitoring and learning. A national agroforestry policy or strategy may benefit from further elaboration at the subnational level, where local circumstances can shape the approach and also ensure alignment with local needs and concerns, as well as greater involvement by farmers, their organizations and community groups in the decision-making process.

Introduction

In recent years, the attention paid to agroforestry in the cocoa landscape has increased significantly. Agroforestry is not new; it has been practised for thousands of years, and in the past cocoa was grown in highly complex agroforestry systems in many parts of the world. However, in the 1970s research and extension programmes started to favour and promote no-shade cocoa, especially in booming cocoa areas in countries such as Ghana and Côte d'Ivoire. Combined with higher migration and more effective techniques for cutting trees, this resulted in an increase in monoculture cocoa production (Ruf and Schroth 2004).

Recently, however, actors across the sector have started to realize that full-sun monoculture is not sustainable and that it poses a risk to farmer livelihoods, global cocoa supply chains and the environment (Andres et al. 2016). Conversely, cocoa agroforestry systems can bring a wide range of ecological benefits: conservation of floral and faunal biodiversity, carbon sequestration, preserving and increasing soil moisture and fertility, contributing to pest control, and microclimatic control such as stimulating rainfall and many other services (van Noordwijk 2021; Reith et al. 2020). Moreover, it can diversify income sources (Koko et al. 2013), reduce input costs (Wainaina et al. 2021) and provide valuable food and materials for households and local markets (Cosyns et al. 2011).

Encouraging farmers to adopt agroforestry requires an integrated approach by multiple actors, and working beyond the farm itself, as agroforestry is related to the surrounding landscape (e.g., tree seeds from nearby forests). Recent years have seen both public and private commitments to the increased use of agroforestry in the cocoa sector. For example, the Ghanaian and the Ivorian governments, representing the countries where cocoa production is concentrated, have launched the Cocoa & Forests Initiative (CFI). The CFI is a commitment of these top cocoa-producing countries with leading chocolate and cocoa companies to end deforestation and restore forest areas, and it includes agroforestry as part of its objective to increase sustainable cocoa production. The two governments have also integrated agroforestry in their extension support to farmers and have developed

programmes to promote tree planting on farms. Some civil society organizations (CSOs) have projects that support farmers in shifting to agroforestry. Both public and civic actors shape the enabling environment for agroforestry, such as policies on land and tree tenure. Recent initiatives in Europe, such as the National Initiatives on Sustainable Cocoa in Europe (ISCOs) and the European Union Alliance on Sustainable Cocoa, also include agroforestry commitments. Leading chocolate brands and cocoa traders have joined the CFI and signed the ISCOs and have increased their efforts to promote agroforestry among the farmers in their supply chains.

Despite these increased efforts, the lasting adoption of agroforestry at scale is lagging. Although there is limited data available on the success rates of agroforestry programmes, there are indications that past programmes that focused on distributing tree seedlings have been unsuccessful in sustainably increasing timber tree stocks in cocoa landscapes (Kouassi et al. 2023) and that large parts of cocoa farms are still under low-shade systems. According to 2020 data, an estimated 80% of the area under cocoa cultivation in Ghana has few or no natural or planted trees (Critchley et al. 2022). Therefore, there is a need to gain a better insight into agroforestry promotion strategies and develop recommendations to further strengthen the support for agroforestry.

Aim of this report

This is a report of a study by Tropenbos International, Tropenbos Ghana and Nitidae on the role of the private sector in promoting agroforestry adoption in Ghana and Côte d'Ivoire. Cocoa and chocolate companies are important investors in agroforestry, and are well-positioned to incentivize it and to introduce and test new techniques, allowing for further scaling. At the same time, having multiple private-sector agroforestry initiatives can result in a lack of coordination and insufficient alignment with national initiatives. Moreover, company commitments may result in top-down implementation, whereby company interests and global agendas are imposed on cocoa farmers and their landscapes.

To date, there has not been an overview of what various companies are doing, and how their efforts can help to unleash the potential of agroforestry. Reporting on sector initiatives tends to focus on seedling distribution numbers, and company sustainability reports often cover only success stories; these provide little information on the approaches used by companies, their challenges and the lessons learned. This report therefore aims to do the following:

- document the strategies, challenges and lessons of cocoa and chocolate companies to better understand what they are doing and why;
- provide recommendations to companies to improve their agroforestry promotion strategies, based on research on factors that influence agroforestry adoption and lessons from their peers; and
- provide recommendations to the cocoa sector as a whole, building on the lessons from the companies and on a literature review regarding the enabling environment for agroforestry adoption.

The report is structured around the case studies of six companies and the various strategies they use to promote the adoption and scaling of agroforestry in Ghana and Côte d'Ivoire (Table 2). The case studies are based on interviews with company representatives and on secondary data; they are found in Annex 1–6 of this report. In selecting the cases for this study, the authors approached companies in the Tropenbos network; not all companies were approached and not all those approached agreed to participate.

Table 2. Case studies

Name of company	Type of company	Country case study	Scope of study
Cargill	Trader/processor	Côte d'Ivoire and Ghana	project
CÉMOI	Chocolate manufacturer	Côte d'Ivoire	supply chain-wide
ETG | Beyond Beans	Trader/processor	Ghana	project
HALBA	Chocolate manufacturer	Ghana	project
Tony's Chocolonely	Chocolate brand	Côte d'Ivoire and Ghana	supply chain-wide
Touton	Trader/processor	Ghana	project

The report is set up as follows:

- Chapter 1 gives a short introduction into the potential of agroforestry in cocoa landscapes.
- Chapter 2 gives an overview of the factors that influence the adoption of agroforestry by farming households.
- Chapter 3 presents an overview of the findings from the case studies.
- Chapter 4 contains reflections on the case studies and recommendations to companies.
- Chapter 5 provides suggestions on collaborative action and further research to the sector

The case studies can be found in the annexes.

Limitations

This report does not compare or rank company strategies, nor does it provide an evaluation of the company cases. Moreover, the report only covers a limited number of company cases, and therefore does not provide a full overview of company-led agroforestry efforts or of agroforestry in cocoa landscapes in West Africa. Also, the case studies are not always representative of the work that these companies do across their supply chains, and their company-wide agroforestry policies are not analyzed. The case studies were based on available documentation and interviews with company representatives, and findings were not validated in the landscapes or through external interviews.

Chapter 1.
Agroforestry in cocoa landscapes

Definitions

Agroforestry signifies an association between trees and cultivated crops (Nair 1993). Cocoa agroforestry is defined here as a production system that combines cocoa trees with non-cocoa tree species for one or more specific benefits, and may also include other (non-tree) crops. Although there is no single best model for cocoa agroforestry, as this will depend on many factors such as climate, soil type and farmers' preferences, it is important to have a common understanding of the various types of agroforestry, and how they have different results and trade-offs between cocoa yields and provision of ecosystem services.

The German Initiative on Sustainable Cocoa identifies the following categories of cocoa agroforestry (GISCO 2022; rephrased from the GISCO definitions):

1. **Entry level:** At least 16 (non-cocoa) trees per ha with a minimum of three different tree species that are preferably native. This corresponds to CFI and World Cocoa Foundation (WCF) indicators on agroforestry.
2. **Basic:** At least 40% shade canopy cover, with a minimum of five different native tree species. This is in accordance with Rainforest Alliance's shade coverage and species diversity reference parameters.
3. **Advanced:** At least 40% shade canopy cover across the landscape or farm group, minimum of 12 different native tree species per hectare; at least 15% native vegetation coverage and two strata or stories and shade species should attain a minimum of 12–15 metres in height.
4. **Dynamic agroforestry (DAF):** These systems are characterized by a very high density of trees per hectare. There is an abundance of different tree species, high biodiversity, plant communities with different life cycles that serve different purposes (CO_2, income sources, food etc). They grow in different stories (strata) without competition. There are at least three different stories, regenerative practices are used, and food security and income sources outside of cocoa are guaranteed. HALBA's dynamic agroforestry projects are seen as a model for this category (see Chapter 3 and Annex 4 for more details on HALBA).

A potential pitfall of categorizing agroforestry in this way is that it does not account for different contexts or different starting points. For example, if entry-level or basic agroforestry replaces diverse existing agroforestry systems or fallow secondary forest regrowth it should be considered as a degradation, even if it offers relatively more environmental services compared to full-sun cocoa systems (Blaser et al. 2018). Moreover, there is a risk that agroforestry in its simplest form (with low shade standards) will not be able to meet the need to protect and restore ecosystem services and support farmers' resilience (Ruf 2011). In addition, current classification of agroforestry is often based on shade levels and number of trees per hectare, although other indicators such as basal area may be more meaningful (Box 1).

Box 1. Basal area: an alternative indicator

Commonly, indicators such as shade rate, canopy cover and tree density are used to classify agroforestry systems, set thresholds for different categories and define requirements. However, these indicators may be difficult to measure (e.g., shade cover) and are often only weakly correlated to the provision of ecosystem services; counting the number of trees does not provide information about their age and size, and therefore their functions such as carbon storage.

The basal area represents the area occupied by tree stems at breast height over the area of the plot. It is a common indicator used in forestry and a useful one to use in classifying cocoa agroforestry because it is relatively easy to measure and correlates significantly with carbon storage. It also encompasses the diversity of agroforestry systems. For example, a basal area of 8 m^2/ha (the threshold to obtain an agroforestry premium in, for example, the Nitidae SAF-ART framework) can be reached with either a large number of small trees, such as fruit trees and young forest trees, or with fewer very old and tall trees. Therefore, it grants farmers the freedom to adopt the agroforestry system suited to their situation while providing a certain level of ecosystem services (Nitidae 2021).

The potential of agroforestry

Cocoa yields and other benefits

Agroforestry's wide range of potential benefits have been well documented (e.g., Thompson et al. 2020) and include resilient livelihoods, climate change mitigation and biodiversity conservation (Kusters 2023). Moreover, agroforestry systems seem to have a much longer productive lifespan than monoculture systems (Niether et al. 2020). Table 3 gives an overview of agroforestry's potential benefits to the environment, climate, agricultural production and socioeconomic circumstances. The extent to which this potential is realized depends on the conditions under which agroforestry is promoted and on the enabling environment. The benefits of agroforestry are further studied in an upcoming issue of Tropical Forest Issues.

Table 3. Potential benefits of cocoa agroforestry

Environmental and climate benefits	Carbon sequestration
	Enrichment of soil fertility
	Regulation of air and water quality
	Wind break
	Reduced erosion
	Maintaining or increasing biodiversity
Cocoa production benefits	Improved farm adaptation to climate change (certain contexts)
	Pest control and resilience to disease
	If well-designed, maintenance of cocoa yield in the short term and increased overall yield in the long term
Socioeconomic benefits	Support for income diversification
	May reduce labour costs and input costs
	Support for household consumption for enhanced food security, construction materials, medicinal products, firewood, etc.
	Increased resilience to shocks and trends

Note: Adapted from Thompson et al. 2020

Due to the varied circumstances, there is no single statistic on the impact of agroforestry on cocoa yield. A 2022 review of agroforestry research found that on average simple cocoa agroforestry has a yield 2% lower than monoculture. For more diverse agroforestry the cocoa yield was reduced by 14% (Mattalia et al. 2022). Another study, by Blaser et al. (2018), clearly showed how agroforestry's environmental and socioeconomic impact depends on shade levels. According to that study, in West Africa, the trade-off between ecosystem service provision and agricultural production is reached at 30% canopy cover. A meta-study by Niether et al. (2020) that directly compared cocoa agroforestry and monocultures concluded that "cocoa yields in agroforestry systems were 25% lower than in monocultures, but total system yields were about ten times higher, contributing to food security and diversified incomes" (Niether et al. 2020: 1).

Indeed, there is a need to focus on both cocoa and non-cocoa yields, and on comprehensive analyses that consider the multiple costs and benefits of agroforestry for farmers, their communities and their landscapes, and compare them to the cost and benefits of monoculture cocoa in the short, medium and long term.

Agroforestry in the landscape

In addition to considering agroforestry at the farm level and for households, it is also important to look at it as a way to integrate more trees in the landscape (Mbow et al. 2014). Agroforestry should be seen in the context of the landscape, where restoration and forest protection efforts are also included. In some parts of the landscape, more complex agroforestry models may be needed (e.g., for landscape connectivity, areas close to rivers, on highly degraded lands). Different landscapes require different approaches (Figure 1).

Full-sun monoculture	Diverse agroforestry systems in place	Old-growth forest with (risk of) new cocoa farms encroaching
Goal: Introduce diverse agroforestry **Geographies:** Western Côte d'Ivoire, Ghana, South-West Cameroon, Sulawesi (Indonesia) **Necessary interventions:** Introduce trees in existing farms, designate land for reforestation, scale up to more complex agroforestry systems.	**Goal:** Preserve and promote diverse agroforestry systems **Geographies:** East Côte d'Ivoire, *cabrucas* systems in Brazil, Bolivia, and other parts of Central and South America and the Caribbean, Central and Eastern Cameroon **Necessary interventions:** Recognize the value of these systems, preserve, and find ways of scaling-up, prevent transformation into monoculture or downgrading to simple agroforestry.	**Goal:** protect forests through agroforestry in fallows **Geographies:** Amazon Basin, Chocó-Darién Rainforest, Mesoamerican Rainforest, Congo Basin, South East Asia **Necessary interventions:** Establish agroforestry systems on fallows to limit deforestation/ forest degradation, coupled with mapping, monitoring, and strong enforcement of no-deforestation policies.

Figure 1 . Landscape agroforestry approaches. Adopted from Sanial et al. 2020.

The 2020 agroforestry consultation paper of the VOICE network advocates for developing optimal systems by involving all stakeholders in the local cocoa landscape to together define the aim of any interventions and the minimum agroforestry requirements (Sanial et al. 2020). In this approach, it is important to ensure that agroforestry contributes to these goals:

- maintaining on-farm ecosystem services such as carbon sequestration, nutrient cycling, pest control, pollinator habitat and soil quality;
- restoring degraded forests, thereby replenishing environmental functions, including protecting biodiversity, connecting primary forests, providing habitat for native species, preventing soil degradation and associated water pollution, and preserving natural streams, local humidity and rainfall;
- increasing the long-term productivity and resilience of cocoa-growing areas, especially in the face of climate change; and
- providing diversified food and income to farmers.

Chapter 2.
Factors that influence agroforestry adoption

Although agroforestry has the potential to generate multiple benefits, adoption and scaling of it has lagged. This may be in part because the dynamics around agroforestry adoption at the farm level are not fully understood, or are oversimplified in the programmes that promote it (Agmare and Darr 2020). The sustainable rural livelihoods framework of the Institute of Development Studies (Scoones 1998) and the sustainable livelihoods framework of the Department for International Development (DFID 1999: 3), offer an approach for understanding how farmers' livelihoods are shaped, and can give insight into when and why farmers decide to make changes to their farming system. Both frameworks include types of capital; the DFID framework is centred around five types of capital that comprise a farmer's livelihood assets (Table 4).

Table 4. Types of capital that comprise livelihood assets

Type of capital	Components
Human	age, gender, skills, knowledge, education level, health of the household members and available labour
Social	social networks, social costs, access to information and political influence and status (e.g., participation in a cooperative or leadership position in the community)
Financial	includes cash income, paid work and access to credit and savings
Physical	markets, roads from homes to urban centres/markets, road conditions, vehicles, and agricultural equipment/tools; access to inputs
Natural	farmland size, farmland quality (e.g., soil fertility) and crop diversity and access to natural resources; trees on farms, land ownership

This approach conceptualize how people, households and communities draw on these different types of capital to develop a range of strategies that achieve their desired livelihood outcomes. This process is influenced by the extent of their vulnerability and by a range of institutions and processes. Some of the weaknesses of the DFID framework — such as a lack of focus on intra-household relationships, not enough acknowledgement of how local livelihoods are embedded in and shaped by larger networks and processes, and not sufficiently addressing the influence of politics and power — have been noted (Natarajan et al. 2022). Despite these limitations, the framework is useful to better understand agroforestry adoption (Thomson et al. 2020).

Factors that influence agroforestry adoption

This report builds on the livelihood frameworks and presents an overview of the internal and external factors that influence agroforestry adoption (Figure 2).

- Internal factors include the livelihood assets of the farming household, including the five types of capital (Table 4). These livelihood assets, combined with agroforestry features, influence the decision-making process at the household level on whether to adopt agroforestry. This process is shaped by the perceptions and attitudes of various household members, and by intra-household dynamics. It is important to recognize that access to and control over livelihood assets can be different for different household members of the same household.
- External factors include shocks, trends and seasonality, as well as the social, political and economic context. Moreover, the features of the agroforestry model are an important factor that farmers will consider in their decision about whether to adopt agroforestry.

Each of these factors is explained in more detail below.

Internal factors

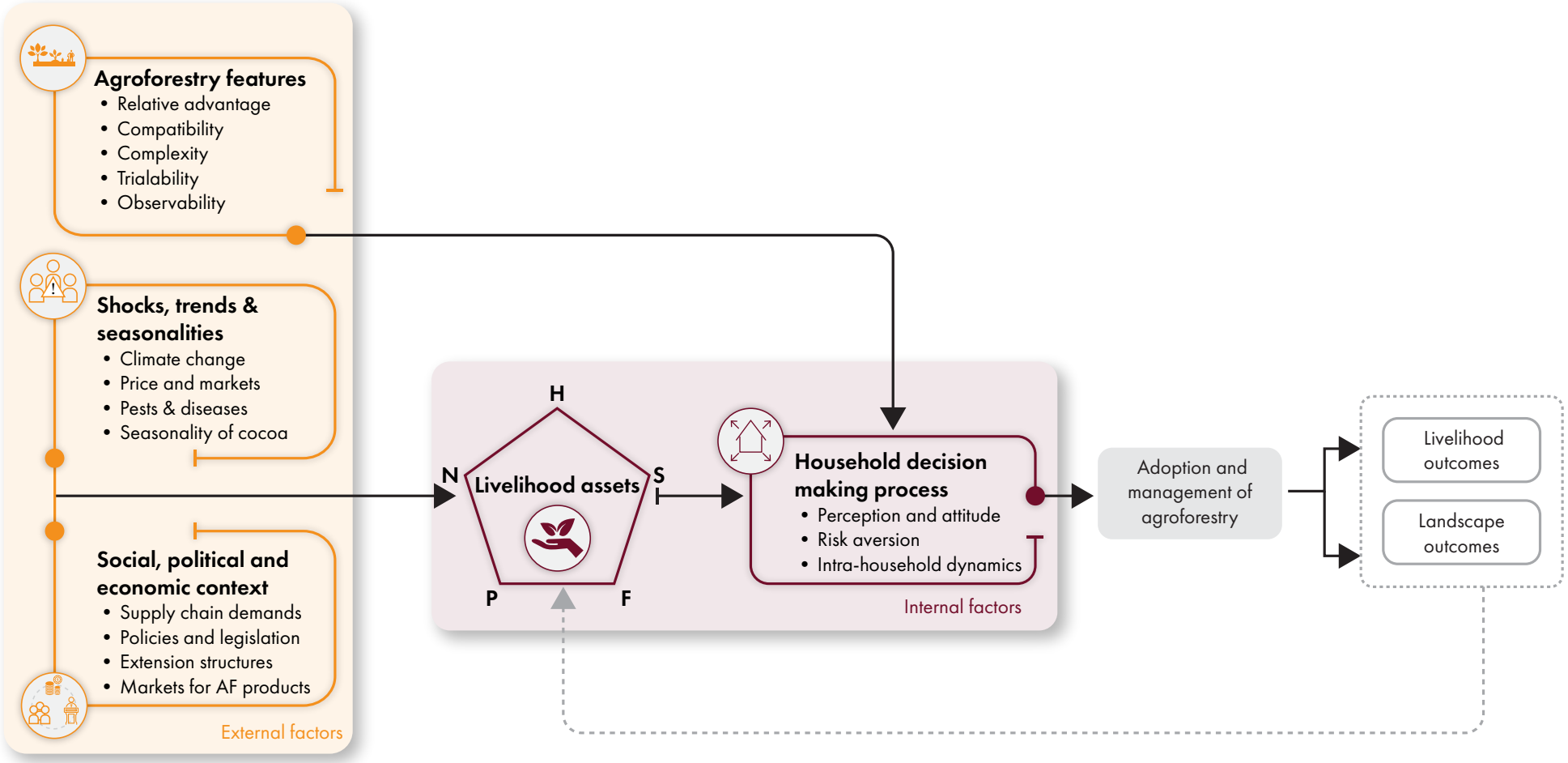
Human capital

Age is known to be an important element of human capital; previous studies have shown that as farmers get older they are less likely to be open to innovation, which decreases their uptake of new farming techniques (Bymolt et al. 2018; Habraken et al. 2022). According to Mwasi et al. (2015) this trend is also observed in agroforestry; young farmers tend to be more willing and able to take risks and invest in the long term. They are also more likely to bring in fresh ideas and new approaches. At the same time, younger farmers might perceive agriculture in general as an unattractive option, and engaging them might require extra efforts and/or incentives (Kusters 2023).

Gender is also likely to influence agroforestry adoption. Agroforestry is particularly important to and well suited for women as it is a low-cost and low-technology system that can provide fuel and food (Eklud 2009). Traditionally, in sub-Saharan Africa, women collect firewood for cooking and are often responsible for managing household gardens, and for collecting and marketing non-timber forest products such as nuts, spices and medicinal plants (Kusters 2023). For female farm owners, a challenge is that their plots of land tend to be smaller than those of male farmers (Bymolt et al. 2018), and from these small plots alone it can be almost impossible to maintain a living income. For female spouses of farmers, a challenge is that they often lack secure access to their land and have little decision-making power over the cocoa farm. Usually spouses are not directly targeted with agroforestry opportunities, and they often lack access to services (Heck and Laven 2022; Kusters 2023).

It is important to note that, even though studies show the influence of age and gender on agroforestry adoption, "women" and "youth" are highly diverse groups; different people face different challenges and have different opportunities.

Adoption of agroforestry is also influenced by level of education. When farmers achieve higher levels of education, it is easier for them to understand and utilize the information provided, which is likely to have positive impacts on agroforestry adoption (Danquah and Joseph 2017). Several studies suggest a positive relationship between farmers' skills, knowledge and experience and adoption of environmentally friendly management (e.g., Chaves and Riley 2001; Quiroga et al. 2015; Danquag and Joseph 2017). It seems logical that when farmers are trained and coached in agroforestry practices, and understand how these benefit them, they will develop a more positive attitude to adoption. This was the conclusion of a recent (relatively small) study among cocoa farmers



Note, types of capital: H: Human, S: Social, F: Financial, P: Physical, N: Natural

Figure 2. Internal and external factors that influence agroforestry adoption

in Nigeria, which found that access to information and extension services was associated with farmers' greater willingness to engage in agroforestry (Arimi and Omoare 2021). However, some farmers lack incentives to attend training, or are difficult to reach by extension agents (Bitzer et al. 2020).

Little information is available about the influence of labour on the adoption of agroforestry. Armengot et al. (2016) found that agroforestry systems in Bolivia had higher labour demands than monoculture cocoa farms, but also showed a higher return on labour, mostly due to higher revenues. On the other hand, Nunoo and Owusu (2017) argue that the higher shade densities on cocoa agroforestry farms reduce labour costs.

Social capital

Farmers' social capital; for example, membership in farmer-based organizations (FBOs) and awareness of certification initiatives, influences their willingness to adopt sustainable cocoa production practices (Aidoo and Fromm et al. 2015). Membership in an FBO facilitates adoption due to the dissemination of information among members; for example through peer-to-peer exchange (Amare and Darr 2020; Aidoo and Fromm et al. 2015; Isaac et al. 2007). One other big advantage is that an FBO can facilitate and organize scaling up by grouping farmers; this facilitates access to training, markets, bargaining, logistical support and financial services.

Financial capital

A lack of capital (including savings) or credit can constrain farmers from making on-farm investments and from diversifying trees and crops (Schroth and Ruf 2014; Engel et al. 2008). The investments required for agroforestry depend on the type of practice; more intensive agroforestry can require larger investments. Investments may include purchasing seedlings, labour and transportation costs, as well as opportunity costs. Moreover, enabling investments may be required for measures such as documentation of land and tree tenure. Financial incentives are often used, such allocation of premiums for agroforestry adoption or payments for environmental services (PES). However, markets for ecosystem services produced by agroforests in West Africa are not yet fully functional. Although there are potential buyers for some environmental services, many challenges remain in connecting these buyers to agroforestry suppliers. Therefore, it is important to recognize and promote the multiple benefits of agroforestry for cocoa smallholders, rather than focusing on the financial benefits.

Physical capital

Relatively little is known about how physical capital — such as access to planting materials (including shade trees) and to roads and markets — influences agroforestry adoption. What is known is that finding markets for crops other than cocoa is challenging, as these value chains are less developed. With few market opportunities for alternative crops, the potential benefits of agroforestry might be diminished. However, it has been shown that around big urban centres, where such markets do exist (e.g., near Abidjan in Côte d'Ivoire and Yaoundé in Cameroon), agroforestry systems associating fruit trees (avocado, mango, orange) and cocoa trees were developing (Dury and Temple 1999).

Natural capital

Land (quantity and quality) is a key component of natural capital. Nunoo et al. (2020) found in Ghana that farmers with large farms were more likely to adopt agroforestry. Sanial (2019) found that the diversity of the agroforestry system is inversely correlated to the size of the farm and that households with the smallest farms tend to invest in diversified systems in which they can also produce staple crops (Sanial 2019).

Agroforestry adoption relies on an individual's legal ability to maintain and utilize trees. Insecure land tenure is a major barrier to smallholders investing in agroforestry. Insecure ownership of tree resources is another major concern.

The quality of the land (e.g., soil fertility) — as well as other ecological factors related to topography and the environment — also influence agroforestry adoption. Generally, poor biophysical conditions (e.g., steep slopes or potential for high erosion) encourage adoption of agroforestry practices that can alleviate these situations (Pattayanak et al. 2003; Liyama et al. 2017). However, the quality of some farms may be below the threshold of useful investment (Pattanayak et al. 2003).

Nunoo et al. (2015) found that farmers perceive increased access to nutritious food as a key benefit of agroforestry. And households that depend on firewood as their main source of energy may be encouraged to adopt agroforestry when there are no trees or forests nearby or when these are not accessible (Kouassi et al. 2023).

Table 5 summarizes the findings from the literature regarding the influence of livelihood capital on agroforestry adoption. The most important finding may be that many of these factors are not yet well understood, and neither are the interactions between the factors.

Table 5. Influence of livelihood capitals on agroforestry adoption

Factor	Indicator	How it influences agroforestry adoption	Key references
Human capital			
Age	Age of the head of the household	Younger farmers tend to be more willing to adopt	Mwasi et al. 2015
Gender	Gender of the head of the household	Agroforestry suits women, but women lack assets and decision-making power	Eklud 2009; van Heck and Laven 2022
Education	Highest level of completion Literacy level	Higher education enables adoption	Danquah and Joseph 2017
Skills/ knowledge	Access to training in agroforestry Number of completed training sessions in cocoa agroforestry	Access to skills in and experience with agroforestry increases adoption	Chaves and Riley 2001; Quiroga et al. 2015; Danquah and Joseph 2017
Available labour	Household labour Hired (seasonal) labour Presence of labour service groups	Weeding/thinning by hired labour may weaken agroforestry adoption as workers might not know which trees to preserve. Perceived workload may limit willingness to adopt agroforestry	Uribe Leitz and Ruf 2019; Armengot et al. 2016
Social capital			
Membership in an FBO	Membership in an FBO	Membership provides access to information, services and potentially markets	Amare and Darr 2020; Aidoo and Fromm et al. 2015
Certification	Certification status	Certification promotes agroforestry and pays a premium price	Smith-Dumont et al. 2014
Financial capital			
Access to finance	Access to a formal loan in previous 12 months	Access to finance favours on-farm investments	Schroth and Ruf 2014; Engel et al. 2008
Access to savings	Membership in a savings group (e.g., Village Savings and Loan Association)	Access to savings may favour investments in diversification	Tropenbos Ghana 2023
Physical capital			
Access to shade tree seedlings	Nearness to shade tree nursery	Low willingness of farmers to invest time and funds in acquiring shade tree seedlings	Sanial 2019

Table 5. continuation

Factor	Indicator	How it influences agroforestry adoption	Key references
Access to markets for alternative tree crops	Nearness to paved roads Nearness to markets Existence of markets	Without markets for alternative crops the economic benefits of agroforestry will be lessened	Dury and Temple 1999
Natural capital			
Land area	Size of the overall farm (ha) Size of the cocoa farm (ha)	Diversity of agroforestry systems is inversely correlated to the size of the farm Smaller and more vulnerable farmers choose less risky systems	Sanial 2019
Land tenure	Land tenure status	Insecure land ownership reduces willingness to invest in timber tree planting	Mwase et al. 2015; Chitakira and Torquebiau 2010
Natural regeneration	Number of species and trees that regenerate each year Farmer managed natural regeneration	A high natural regeneration capacity will allow for a transition to a diverse agroforestry system at a low cost	Kouassi et al. 2023
Land and soil characteristics	Soil fertility Slope Erosion	Poor biophysical production conditions can encourage adoption of agroforestry	Liyama et al. 2017
Food scarcity	Number of months with food scarcity	Agroforestry can improve access to food, and households that face more food scarcity may be more inclined to adopt agroforestry	Nunoo et al. 2015
Firewood availability	Main energy source Time spent collecting wood	Lack of access to firewood encourages agroforestry adoption	Kouassi et al. 2023

Perceptions and attitudes

It is important to pay attention not only to the livelihood assets of farming households, which can be objectively assessed, but also to the way that farmers and household members perceive their situation, their farm and their environment. Addressing such perceptions can support eventual agroforestry adoption (Meijer et al. 2015). Perceptions are strongly influenced by needs and by prior experiences.

Besides maximizing productivity and profitability there are many other reasons why people make decisions within farming households, such as minimizing risk, stabilizing income and increasing food security (Feola and Binder 2010; Edwards-Jones 2006; McGregor et al. 2001; Schroth and Ruf 2014). Several studies have shown that risk aversion is an important factor in whether farmers adopt agroforestry or full-sun systems. Their decision depends on the way they perceive the risk, which in turn depends on their socioeconomic situation (Eldin 1989; Gely 1989; Johns 1999; Ramirez and Somarriba 2000; Sanial 2019). Strategies to alleviate farmers' risks will be impeded if they are not based on an understanding of how farmers perceive risks (Eitzinge et al. 2018).

Although agroforestry brings potential benefits, farmers (e.g., in Ghana and Côte d'Ivoire) might see it as a potential risk. They may fear an increase in negative environmental effects (e.g., pests), an increased threat of legal and illegal timber cutting, or be concerned about the physical danger of having large trees on the farm (e.g., falling branches). Moreover, Ruf (2011) reports that farmers often perceive that growing cocoa under shade is a thing of the past, unable to compete with more intensive cocoa production in full sun.

Perceptions and attitudes can be influenced by other factors, such as collective values in the communities, and can change over time. For example, Sanial (2019) found that as farmers' socioecological environment changes

(forest depletion, climate change, soil degradation, land tenure insecurity), the way they perceive trees is evolving in two ways: they called trees with a negative influence "false trees" and refer to desirable species as just "trees." Understanding such perceptions can help agroforestry promotion: it is better to talk to farmers about particular species (the desirable ones) rather than talking about trees in general.

Intra-household decision-making

Agroforestry strategies should take into account dynamics that underlie decision-making in households that depend largely on cocoa for their income. Studies show that it is usually the male farmer who sells the cocoa and receives the revenue, by default taking control over the family's income from cocoa (Bymolt et al. 2018; Bah and Laven 2018). This means that co-farming spouses (particularly in Côte d'Ivoire) often depend on their husband's goodwill for access to and influence over the cocoa income they generated together.

In Côte d'Ivoire, Sanial and Ruf (2018) found differences between men and women in the household regarding Kola trees. Kola trees were considered by extension services as being "bad" trees for cocoa farms (hosting pests and having the same nutritional needs as cocoa) and farmers were encouraged to remove them. However, women harvest nuts from these trees and earn significant income from selling them, and wanted their husbands to keep the trees.

External factors

Shocks, trends and seasonality

The impact of shocks, trends and seasonality on the farmers' livelihoods has been referred to as the vulnerability context (DFID 1999). Although most households have diversified income, they still depend heavily on cocoa, which increases their vulnerability.

This vulnerability is worsened by the seasonality of cocoa; there is little economic activity outside the main cocoa season, which can push farmers into taking out unfavourable loans and can bring periods of hardship. Income diversification, including from alternative crops, can reduce dependency on cocoa production and increase and stabilize household income.

It is important to distinguish between diversification of income and diversification of the production system. Increasing income diversity, by having multiple income sources, is an important element in strengthening farmers' resilience. This could be the result of growing a range of crops, or could come from off-farm economic activities. Diversification of production through agroforestry can also strengthen resilience, not only by providing additional income sources, but also because it can lower input costs, increase access to food and firewood, and provide significant environmental benefits to the farm and the landscape.

Individuals rarely respond to only one shock or stressor at a time (Ansah et al. 2021; Eakin et al. 2009). When faced with a shock (e.g., a significant price drop, an outbreak of pests and diseases, or an increased climate risk), some farmers may decide to switch crops, even though this does not bring immediate results. For example, in Côte d'Ivoire, farmers increasingly value keeping some forest trees in their cocoa farms to reduce climate risks such as long droughts (Smith-Dumont et al. 2014). According to farmers, they specifically choose evergreen species for their role in maintaining soil moisture and providing shade during the dry season (Sanial 2019). In comparison to climate change impacts, shocks from pests and disease are more immediate. Black pod may encourage farmers to reduce shade (Niether et al. 2020); mirids, loranthus (mistletoe) or witches' broom may encourage them to increase shade (Niether et al. 2020).

In response to outside shocks, most farmers do not totally abandon cocoa, but convert part of their cocoa farm into another crop, usually cashew, rubber or palm (Ruf and Schroth 2013; Sanial 2019). Some farmers plant rubber in between cocoa trees; while rubber is growing, their cocoa is still producing (Sanial 2015).

Social, political and economic context

This affects the adoption of agroforestry because it influences the livelihood assets of farming households. It grants or denies access to assets, it enables or prevents people from transforming one type of asset into another through markets (e.g., selling a natural capital such as timber to turn it into financial capital), and it creates or limits the

conditions that strengthen human and social capital. This context also includes the power dynamics that influence farmers' situation and their ability to make decisions in their best interest. The power dynamics around agroforestry have not been widely studied, but some recent papers analyze power in the context of promoting climate-smart cocoa (Maguire-Rajpaul et al. 2022) and in the establishment of gazetted agroforests as a new forest category in Côte d'Ivoire (Dieng and Karsenty 2023). These papers highlight that both government and company-led programmes risk entrenching existing power asymmetries and continuing to marginalize farmers' voices. It will be important to find approaches whereby agroforestry empowers farmers and farmer groups.

Important contextual factors to consider here are cocoa supply chain demand, policies and legislation, extension services and technical support, and access to markets.

Cocoa supply chain demands

What cocoa buyers ask for has an influence on how cocoa farmers manage their farm. This may involve companies' sustainability programmes and commitments on agroforestry (e.g., to source 100% of cocoa from agroforestry), which are then transferred to farmers through extension programmes; or certification, which puts requirements on farming practices in exchange for a premium payment (Millard 2011). Although these commitments and supply chain demands can provide incentives for agroforestry, there is also a risk that they maintain or worsen inequal power relationships by applying universalized requirements to landscapes and farmers and by reducing farmers' flexibility to maintain or expand local practices. This further highlights the importance of adopting a locally led landscape approach to integrating trees on farms and in the landscape (Maguire-Rajpaul et al. 2022).

Policies and legislation

Government support is a necessary factor in agroforestry adoption. Agroforestry benefits from coherent and well-enforced policies and legislation that have an integrated perspective on land use and that recognize the close link between agriculture and forestry and the importance of environmentally sustainable management. Conflicting policies lead to conflicting messages to farmers: one department may focus on intensified monoculture cocoa production while another department promotes diverse agroforestry. A lack of alignment between policies may result in restrictions on farmers (e.g., related to the harvesting of timber and non-timber forest products) and hamper effective collaboration by various government departments that are linked to agroforestry, including agriculture, forestry and planning.

Conversely, an enabling policy environment can help to promote the adoption of agroforestry by providing financial incentives and redirecting efforts and investments away from non-sustainable practices. Integrated policies that address agroforestry can further help to establish the necessary supports, such as extension services, access to planting material and investment in research. Effective implementation and enforcement of policies and legislation is needed to prevent illegal activities such as logging of trees on cocoa farms or unauthorized permits for timber extraction.

Important policies that affect agroforestry relate to land tenure and tree tenure. These policies are often unclear and are unfavourable to farmers. The various land-tenure arrangements, including customary use, in Ghana and Côte d'Ivoire — combined with a lack of coordination between customary and statutory tenure systems and a lack of documentation — undermine secure land ownership for many cocoa farming households. This tenure insecurity is a major barrier to smallholders engaging in agroforestry practices. Farmers are not willing to invest their resources in land that they do not have secure ownership of, since access to future returns is not guaranteed (Mwase et al. 2015; Chitakira and Torquebiau 2010).

In Ghana, land ownership and tree ownership are separate. All naturally occurring trees are owned by the national government, including trees that grow on private land. Because of this, farmers and landowners obtain limited or no benefits from nurturing naturally occurring trees on their cocoa farms, and are concerned about the risk of damage to the cocoa farm when these trees are harvested by a timber company. Farmers are concerned that existing concessions give timber companies the right to come into cocoa fields to harvest valuable trees, and that in some cases permission for timber harvesting is granted illegitimately to companies by local government officials (Hirons et al. 2018). Although planted trees do belong to the landowner, the difficulty of proving this and the lack of trust in the system that is supposed to protect these rights also dissuade farmers from planting

trees. Moreover, planting of commercial trees by tenants can be seen by landowners as a way to assert land ownership, and could potentially lead to conflict (O'Sullivan et al. 2018, 2021).

In recent years, a policy was developed in Ghana that allows farmers to register trees on their land in order to claim ownership of them. However, a recent analysis of the policy reveals a number of problems (O'Sullivan et al. 2018); for example, if a farmer fails to register a planted shade tree, there is a risk that it will be perceived as a naturally occurring tree and therefore subject to state exploitation. In addition, tree tenure registry creates an unnecessarily costly, bureaucratic and likely unworkable regulatory burden on farmers and the Forestry Commission. To incentivize farmers to undertake tree planting, O'Sullivan et al. (2021) therefore recommend that tree tenure should be reformed to grant rights over planted and natural trees to customary land rights holders or farmers.

In Côte d'Ivoire, trees had not belonged to farmers for decades, but in 2014 the law changed and conferred ownership of the tree to the owner of the field. However, since only a few farmers have land title the situation remains unchanged for many of them. In addition, it is not uncommon for timber companies to violate this new law. Whether farmers can claim their right to the trees depends on whether timber companies respect existing legislation and on its enforcement by government (Sanial 2018).

Extension services and technical support

Extension services can be crucial in influencing the perception, knowledge and attitudes of farmers (Meijer et al. 2015; Iiyama et al. 2017; Amare et al. 2019). Studies report that easy access to extension services, a high ratio of extension staff to farmers, and frequent extension visits increase agroforestry adoption (Abbas et al. 2009; Makate et al. 2019). The presence of local agricultural extension officers who understand the benefits of cultivating shaded cocoa in mixed systems, and who are able to transfer this knowledge to and share a consistent message with farmers, is crucial (Kusters 2023).

Extension services can be provided by government agencies and cocoa companies, as well as NGOs, and can take many forms, including training, farmer field schools and individual coaching. Often, some type of farmer organization is involved to reduce the transaction costs. A well-functioning farmer-based organization can facilitate training and promote agroforestry adoption among its members by creating an enabling environment.

However, it is important to acknowledge the limitations of extension services in promoting agroforestry adoption. A 2018 study (Bymolt et al. 2018) found that only 49% of respondents in Ghana and 17% in Côte d'Ivoire had received any training related to cocoa farming in the previous five years. Government was reported as the main source of training. The study also found that 50% of the farmers who received training reported that it addressed good environmental practices. However, a survey by World Agroforestry in Côte d'Ivoire found that only 5% of farmers who received training had been informed about shade trees (Bunn et al. 2019).

It is also important to consider who is targeted by agroforestry interventions. Reaching female farmers (and female spouses of male farmers), who often have less education than men, might require adapting strategies and materials for effective consultation and sensitization (e.g., to ensure that materials reflect women's perspectives and cultural sensitivities, that information is user-friendly, and that training tools are participatory). Extension services will also be improved through more diverse extension staff who are knowledgeable about gender dynamics (Heck and Laven 2022).

Reaching workers and sharecroppers as well as farmer owners is also crucial, especially because of their role in weeding and the risk that they might mistakenly remove young trees during this work. However, most of the time, agroforestry sensitization and training is delivered to farm owners without the participation of workers or sharecroppers (Uribe Leitz and Ruf 2019).

Markets for agroforestry products, timber and ecosystem services

These markets are essential to agroforestry adoption. Farmers will be reluctant to make or continue investments in agroforestry if there are no markets for their products, or if they are unable to access those markets or if the prices of agroforestry products fluctuate excessively (Glover et al. 2013). Cocoa generally receives a higher price than agroforestry products, which are sold at local markets or consumed by households (Niether et al. 2020).

The importance of markets for agroforestry products, such as staple foods, international commodities, timber and firewood — and of access to these markets — is often underestimated. If markets are not available or accessible, agroforestry projects risk creating a local oversupply of produce, which results in lower income for farmers and a disincentive to adopt agroforestry. Solutions may include grouping farmers for improved collective market access, better access to market information for farmers, linking rural development and agroforestry programmes, promoting links between farmers and agribusinesses, embedding marketing capacities in farmer groups, and strengthening land and tree tenure to ensure that farmers are able to sell their timber trees through formal markets (Russell and Franzel 2014).

Markets for ecosystem services, including carbon storage, are another potential option that may support agroforestry. There is an increasing number of projects where farmers are receiving payments for ecosystem services, and growing attention to linking cocoa agroforestry to carbon markets (Box 2).

Box 2. Carbon finance and smallholder agroforestry

Various types of carbon insetting and offsetting projects are being developed in the context of smallholder agroforestry. The involvement of smallholders in the establishment of these projects, and the support available to them, are important factors that influence benefits, costs and risks.

Benefits

Carbon projects can generate financial benefits for agroforestry initiatives. Sales of carbon credits can involve direct payments and/or in-kind benefits to smallholders or cooperatives. These benefits are highly dependent on the design and costs of the project, on arrangements between the farmers and the organizations involved in the project, and on the details of the sale of the carbon credits. Carbon projects must ensure that agroforestry already provides multiple benefits to farmers and their communities, and that any financial benefits from carbon credits are additional, rather than the main benefit of the project.

Costs

The implementation and transactional costs of carbon projects can be high, which means that the payments to farmers can turn out small. Farmers may feel that this is unfair, and is insufficient compensation for their time and responsibility.

Risks

Several potential risks are associated with projects that involve carbon insetting or offsetting, including those related to carbon accounting, monitoring and reporting and verification. Specific risks include double counting, lack of permanence and additionality, and risk of leakage and indirect land-use change. Moreover, unclear land and tree tenure can result in a lack of clarity regarding ownership of carbon credits and access to their benefits. It is also important to acknowledge ethical concerns around carbon projects, such as those related to land grabbing and neocolonialism.

Agroforestry features

Agroforestry is not new, and has been practised by farmers for centuries. Innovation science can provide lessons about how innovations are adopted. Rogers and Shoemaker (1972) report that an innovation spreads among members of a social system over time if it possesses five features: relative advantage, compatibility, complexity, trialability and observability. These apply to the context of agroforestry in the following ways.

Profitability, reducing poverty and diversifying income (relative advantage)

Meijer et al. (2015) found that when agroforestry does not reduce the poverty of farming households, its adoption is constrained. This is further confirmed by Glover et al. (2013); they noted that even when farmers gained environmental benefits from agroforestry, they would not adopt it unless it also provided direct benefits such as food, firewood, construction wood and cash, or decreased labour or input costs. This is further demonstrated by the work of Appiah and Pappinen (2010) and Kiptot et al. (2007), who studied local farmers' priorities when tree planting and found that they planted tree species with a short maturation period, which provided them with short-term cash, fuel and shade. Moreover, according to Gyau et al. (2012), agroforestry systems that foster livelihood diversification and alleviate household risk tend to promote agroforestry adoption.

Degree of familiarity (compatibility)

Agroforestry practices that are compatible with local culture, knowledge, traditions and livelihoods are associated with higher adoption rates (Gyau et al. 2012). As an example of a non-compatible approach, in 2010 the first certified cooperatives in Côte d'Ivoire started distributing tree seedlings to farmers in order to promote agroforestry. These trees were mainly exotic species and the farmers did not know them, did not value them and sometimes found that they were not well-adapted to be associated with cocoa. It ended up with very high tree mortality rates. Nowadays, cooperatives distribute local species, which strengthens farmers' interest (Sanial 2015).

Ease of adoption (complexity)

Agroforestry should not be too complex or technical for a farmer to practise; neither should it be too costly or require too much additional work. For instance, a project implemented in Paraguay was abandoned by farmers because the direct sowing of trees between crops proved too difficult to carry out (Evans 1999).

Tangible results (trialability and observability)

Allowing farmers to try out agroforestry measures within a specific timeframe, with tangible and immediate results, will encourage them to continue to maintain and expand their agroforestry activities. Moreover, when these benefits are clearly observable, it may promote further uptake of agroforestry systems within the community.

Ultimately, the decision of the household on whether to adopt agroforestry practices will have an impact on its livelihood assets and on the wider landscape. It is also important to note that the decision to adopt agroforestry is a dynamic process, not a binary choice; there might not be one specific moment when a farmer decides. In addition, the configurations of the agroforestry system will be adjusted over time in a continuous learning and adjustment process.

Although it is understood how some assets influence adoption (e.g., land tenure security), less is known about other factors and how they interact with each other. This overview can bring insight into the processes behind agroforestry adoption, but it is not a blueprint for developing agroforestry strategies.

Chapter 3.
Summary of company strategies to promote agroforestry

This chapter summarizes the agroforestry strategies, challenges and lessons of six companies in the cocoa sector: Cargill, CÉMOI, ETG | Beyond Beans, HALBA, Tony's Chocolonely and Touton. It interprets the strategies of the companies in the context of the five types of livelihoods capital that (Table 4), to see how they targeted the factors that influence agroforestry adoption, and to determine which factors did not receive a lot of attention.

The case studies mostly describe what companies do in specific projects; only the case studies of Tony's Chocolonely and CÉMOI describe actions that are implemented across their supply chain.

Full case studies for each company can be found as annexes here.

Agroforestry definitions, models and main activities

All the companies' agroforestry definitions include the minimum number of trees per hectare, often also with a minimum number of certain species. Three companies (Cargill, CÉMOI and ETG | Beyond Beans) offer multiple planting models. This includes models for boundary planting and small plot reforestation, where the trees are planted outside the cocoa production area. Companies generally work with a list of suitable species, which forms the basis of sensitization of farmers. Then, together with farmers, they develop a final list of the desired species, and this is used for nursery establishment. Several companies identified the need to learn more about which models and species are most suitable for the various climate zones.

It is interesting that most companies promote higher shade tree densities than those recommended by national authorities in the countries of origin (COCOBOD and the Conseil du Café-Cacao), at least in the projects presented here. The exception is Tony's Chocolonely, who argue that promoting less complex agroforestry is

in line with their main aims: to sustainably increase cocoa yields to bring farmers closer to a living income, and reduce the risk of child labour that might occur if there was an increased demand for labour beyond the capacity of the farmers and cooperatives.

HALBA stands out for its choice to practise dynamic agroforestry (DAF), which starts with more than 2,700 trees in the first year and retains more than 300 medium- and long-lived trees of more than 20 different species (in addition to cocoa) per ha in a mature plot. The company made this choice based on the understanding that diverse and highly productive systems are needed to sustainably increase the productivity of cocoa farms, improve livelihoods, build the resilience of current and future generations of farmers, prevent shortages of raw material and help protect forests and other ecosystems. They also believe in the potential of DAF to increase cocoa yields and help restore and sustain ecosystem functions such as carbon storage, soil fertility and water retention.

Table 6 describes the companies' agroforestry models and activities.

Table 6. Case studies: Details of agroforestry models and activities

Name	Agroforestry model	Main activities
Cargill	Three different planting models: 1) boundary; 2) intercropping; and 3) full reforestation Model 1 and 2 use approximately 100 trees per ha	• Feasibility assessment of sites • Building awareness and local technical capacity for ongoing technical assistance to farmers over the duration of the project • Farmer registration and development of an agroforestry plot • Setting up nurseries with women's groups • Training of farmers in how to plant seedlings and tend and prune trees • Payments (PES) to support high rates of tree survival • Facilitating farmer access to land-tenure documentation • Exploring strategies to develop markets by collaborating with timber companies in agroforestry development
CÉMOI	Five different planting models: 1) inside the farm; 2) around the farm; 3) trees inside and around the farm; 4) alternating strips; and 5) micro-forest Tree density ranges from 18 to 70 trees per ha for models 1 to 4	• Setting up community infrastructure (permanent committees, linked to fermentation centres) • Training of trainers (field officers who can train cooperatives) and coaching • Setting up one-ha demonstration plots • Training of nursery operators and establishment of tree nurseries • Sensitization campaigns for cooperative leadership • Collaboration with a timber company to promote tree planting in cocoa farms • Development and testing of participative design using PlantSAF tool (in collaboration with partners)
ETG | Beyond Beans	Standard systems are minimum 20 trees per ha, at least 3 different species, and 5 planting models. More advanced systems are 60+ trees per ha	• Training and individual coaching of farmers • Providing seedlings and supporting nursery establishment • Supporting farmers with obtaining land titles • Setting up Village Savings and Loan Associations for farmers and spouses to facilitate on-farm investments • Payment (PES) for forest protection and restoration • Strengthening the capacities of community resource management committees (CRMCs)

Table 6. continuation

Name	Agroforestry model	Main activities
HALBA	Dynamic agroforestry (mature farms may have more than 300 trees of more than 20 different species per ha)	• Awareness campaigns • Selecting farmers who show an interest and qualify for Gold Standard carbon compensation • Training of lead farmers as agroforestry experts and future coaches • Training of farmers to manage their plot effectively, with regular on-farm visits and guidance • Providing farmers with preferred planting materials and the necessary tools • Strategic pruning • Gold Standard carbon compensation • Developing marketing studies and establishing links with markets for non-cocoa crops • Payment of Living Income Differential based on Living Income Reference Price • Institutional support for the Kuapa Kokoo Farmers Union to make the transition to certified organic cocoa
Tony's Chocolonely	18 shade trees per ha, of at least 6 different species, and to achieve approximately 30% shade cover	• Collaboration with local experts • Sensitization of cooperative members • Training of farmers and individual coaching; • Setting up nurseries (often female-led) • Setting up brigades (young men who work for the cooperatives) to support the cooperative members in labour-intensive farming activities and agroforestry activities
Touton	Timber in Cocoa Agroforestry (TiCA) model (80 trees per ha for maximum 40% shade)	• Community Resource Management Areas (CREMA) consultation and community sensitization. • Training on GAP, agroforestry • Acquiring shade tree seedlings from professional nurseries (in collaboration with FORIG) • Providing and planting seedlings (by youth) • Training of youth to provide labour support • Setting up Village Savings and Loan Associations and training in financial management • Use of mobile decision-making app (FarmGrow), building on farm development plans • Formation of community governance groups • Tree registration

Agroforestry ambitions

HALBA and Tony's Chocolonely are the only companies in the study who had the specific ambition to source all their cocoa from agroforestry plots:

> *"The aim is to source 100% of its cocoa from an agroforestry setting. For the 2023–24 cocoa-planting season, the company expects to plant more than 150,000 shade trees as part of this effort." (Tony's Chocolonely)*

> *"HALBA has set a target of procuring at least 50% of its cocoa beans from DAF systems by 2040, and 100% by 2050. The total amount of cocoa in HALBA's supply chain is estimated to cover approximately 5,000 hectares (ha); so far, HALBA and its partners have transformed about 927 ha of cocoa plantations into DAF systems." (HALBA)*

CÉMOI aims to achieve a target of 100% of cooperatives trained in agroforestry, and 30% of farmers implementing agroforestry on 40,000 hectares in Côte d'Ivoire by 2025.

Companies other than those reported on here did not report a specific target for the supply chain coverage of their agroforestry programmes.

Agroforestry strategies and livelihood assets capitals

This section summarizes the findings of the case studies, according to the five types of capital that comprise livelihood assets (see Table 4). Company strategies tend to focus on strengthening farmers' livelihood assets in relation to agroforestry, and on providing direct incentives for the adoption of agroforestry practices.

Human capital

For companies, a common starting point is sensitization and strengthening farmers' capacities to adopt agroforestry. The case studies record a gradual approach, consisting of three steps: awareness-raising, training and coaching.

Awareness-raising includes building the understanding of cooperative leaders (Cargill) and sensitization of farmers and community consultation (Touton, together with their partner Agro Eco). Some companies use innovative tools to raise awareness. For example, Tony's Chocolonely developed an animated movie that explains cocoa agroforestry, which can be shared via social media. Cargill, together with its implementing partner PUR, carried out an awareness-raising programme through community theatre and radio broadcasts.

Training in agroforestry is often part of training in good agricultural practices, and includes topics such as tree planting, appropriate tree densities, various planting models and pruning, as well as support in species selection. Companies sometimes provide training to farmers directly, through their extension officers; in other cases they train lead farmers who then train other farmers in the community (CÉMOI, HALBA). Often, demonstration plots are used to support this training (CÉMOI). Cargill and ETG | Beyond Beans include gender considerations in training curricula and farmer engagement strategies.

Two companies also work on individual coaching for farmers: ETG | Beyond Beans and Tony's Chocolonely.

> *"... coaching increases the adoption of good agricultural and agroforestry practices, because it gives farmers time alone with a coach to discuss concerns and select optimal planting locations." (ETG | Beyond Beans).*

Another component of human capital is labour; a lack of available, affordable and skilled labour may be an obstacle to agroforestry adoption (Uribe Leitz and Ruf 2019). To address this, Tony's Chocolonely set up labour brigades — young men who work for the cooperatives and support their members in agroforestry activities, such as weeding, transporting and planting shade trees, and setting up composting sites. Touton's partner Agro Eco sets up Youth Teams to plant shade trees to make sure it is done in a professional and correct way. HALBA works with the cooperatives' staff to help establish dynamic agroforestry plots. The company knows that its model is labour-intensive on establishment, but that this reduces over time:

> *"Labour costs lessen over time, in particular due to a decrease in the time spent weeding, and input costs can also be lower than they are in monoculture farming." (HALBA)*

Social capital

The company cases illustrate how capacity building by farmer-based organizations supported farmers through access to training and other services. For example, the CÉMOI case study notes that a convinced and motivated cooperative board and staff had a strong influence on agroforestry adoption. This illustrates the importance of encouraging people to act as role models and change agents. Well-functioning cooperatives that promote adoption and provide agroforestry-related services require a dedicated budget. Tony's Chocolonely reported that cooperative fees and farmer premiums can maintain agroforestry services, such as nurseries and labour brigades; however, initial project funding is needed to set up these structures and train cooperative staff.

The company cases also illustrate the value of other community structures. For example, ETG | Beyond Beans collaborated with Tropenbos Ghana and other partners to support 25 new community resource management committees. The project strengthened the capacities of these committees in forest management planning, forest protection and restoration, and in regulating the harvest of timber and non-timber forest products. The committees are also encouraged to provide input to the formulation of forestry policies at the national, regional and district levels.

Financial capital

Investments related to agroforestry are not limited to purchasing seedlings, but also include the cost of transportation and labour. Opportunity costs (the loss of benefits from alternative options) are also a factor. These costs can pose a barrier for households. The case studies show that the companies often cover direct costs that farmers would otherwise pay; for example, setting up nurseries, buying seedlings or hiring labour.

Some companies (ETG | Beyond Beans and Touton) finance agroforestry adoption by setting up Village Savings and Loans Associations (VSLAs), which can strengthen the financial capital of farming households. Getting a loan from a VSLA is a more affordable and lower-risk option than obtaining one from private moneylenders, who might be a borrower's only other option. Tropenbos Ghana has observed that the members of a VSLA in cocoa-growing communities often use the borrowed funds to hire labour for their cocoa farm, or to invest in farm diversification and marketing of their crops (Kusters 2023). However, more research is needed to understand to what extent lack of access to finance can be a barrier to agroforestry adoption, and how VLSAs can address this barrier.

Some companies invest in strengthening household decision-making by providing training in financial management and decision-making tools. For example, Touton's FarmGrow app combines agronomy and economics, building on the farm development plans that support agribusiness planning and monitoring for cocoa farmers.

Some companies include financial incentives via payments for ecosystem services (PES). Although these relatively small incentives might not contribute much to the household's financial capital, companies report that the payments can be an important factor in persuading farmers to shift to agroforestry. Moreover, PES can allow households to gain a short-term financial benefit from agroforestry, thereby increasing its relative advantage compared to monoculture. An example is the PES system that ETG | Beyond Beans is developing for its project in Ghana, building on experience in previous projects in Côte d'Ivoire. However, ETG | Beyond Beans points out that this PES model is only a temporary measure, and that it is not clear if the benefits of agroforestry, restoration and protection are apparent to farmers, or if farmers would continue with these practices without financial incentives. This raises the questions of whether financial incentives might need to be more structural in nature and to what extent they are scalable.

Some companies pay a higher price to farmers, primarily to contribute to a living income, but also to encourage agroforestry adoption. For example, HALBA paid farmers a living income differential of USD 289/metric tonne for the 2020–2021 season. According to HALBA, this higher price turned out to be a strong incentive for farmers to take part. Ideally, the business case for agroforestry would be strong enough on its own to motivate farmers and it would help strengthen the financial capital of the household. However, most of the case studies suggest that this is not yet the case. HALBA did note that a positive cash flow in the first year and increased food security at the household and community level were particularly important in motivating farmers to adopt the company's DAF model. However, more research needs to be done to understand the full range of agroforestry-related costs and benefits. Both Cargill and HALBA are currently studying the business case of their agroforestry models.

Physical capital

To promote agroforestry adoption, companies invest in improving access to shade tree seedlings and support farmers in accessing a market for their agroforestry products, both of which are elements of physical capital.

Several companies support the establishment of shade tree nurseries, often in collaboration with cooperatives and in many cases run by women's groups (e.g. Cargill, Tony's Chocolonely). Touton encourages communities to establish village nurseries. The costs of establishment are often covered by the company, but the aim is to have

the nurseries run as viable businesses. CÉMOI collaborates with a timber company that provides seedlings and support to farmers for planting and nurturing timber trees.

Several companies mentioned challenges with these shade tree nurseries. As ETG | Beyond Beans reported:

> *"The process of setting up a nursery with a range of tree species as a viable business model is much more complex than establishing nurseries with only cocoa seedlings. The variety of species and the variation in demand make it difficult to establish clear procedures, and farmers are less motivated to pick up, plant and take care of multipurpose tree seedlings than for cocoa seedlings. Much more knowledge is needed on how to grow different species, and for some species seeds are not easily available." (ETG | Beyond Beans)*

Some companies also made reference to a factor that hinders diversification: only a limited number of shade tree species are offered to farmers, so that's what farmers know and what they ask for. Another challenge is that farmers are not necessarily willing to pay for shade tree seedlings, though willingness to pay may be higher when a tree species is scarce and has high local value.

For agroforestry to succeed, the existence and accessibility of markets for its products is key. To promote market access, both HALBA and Cargill are working with their partner cooperatives to make the transition to a role as aggregator and marketer of agroforestry products. PUR (Cargill's implementing partner) is working with three cooperatives on income diversification strategies for agroforestry systems, developing market studies, and assessing the potential for market linkages. CÉMOI is collaborating with a timber company to support the planting and nurturing of timber trees on cocoa farms. In return, the company has the first right to buy the timber. This has helped to establish a positive relationship between cooperatives and timber companies, which is usually not the case.

Natural capital

The trees that already exist on farms, and the potential for natural regeneration of trees, are part of the natural capital of a cocoa household. It is important to remember, however, that in Ghana farmers do not have ownership of these naturally occurring trees. Some companies, such as ETG | Beyond Beans, work to protect existing shade trees on farms and promote farmer-managed natural regeneration.

Land ownership is another key factor in natural capital that influences agroforestry adoption. This is why several companies invest in documentation of land and tree tenure as part of their agroforestry model. For example, ETG | Beyond Beans, together with Meridia, is supporting 3,000 farmers to obtain land and tree titles. However, insecure tree tenure remains a significant obstacle to tree planting, as farmers are concerned that the Forestry Commission can give their trees away to a concessionaire. In Côte d'Ivoire tree ownership is not always clear to farmers, partly because they may not be aware of the reforms to tree ownership regimes. Land and tree tenure interventions can also be expensive. In the case of ETG | Beyond Beans their activities in land and tree registration took half of the project budget. However, a recent study by the European Forestry Institute, Cargill and PUR suggests that investing in land tenure certificates can actually be cost-effective, costing an estimated USD 27 to 36 per hectare (Cargill et al. 2020).

To improve soil quality and promote agroforestry, Tony's Chocolonely invested in composting as a complementary measure. Since one of the aims of agroforestry is to improve soil conditions, Tony's works on effective composting at the farm level to help achieve this objective. Moreover, the biomass from the trees on agroforestry plots can further improve the quality and quantity of the compost. The dynamic agroforestry model of HALBA also has a strong focus on improving soil quality; for example, by integrating biomass trees.

Lessons, challenges and next steps

In the case studies, companies self-reported several lessons, challenges and next steps.

There is a need for a landscape approach, but it can be difficult to engage effectively at this level. Companies see a need for collaboration (e.g., joint financing, including public funding) by various stakeholders in order to promote and scale agroforestry at the landscape scale, going beyond project-based approaches and

institutionalizing measures that support agroforestry. However, establishing these multistakeholder relationships takes time, and companies report that it can be difficult for them to engage in these processes without a clear timeline and outcome.

Farmers' willingness to invest in trees remains low. To change this, it is seen as essential that farmers know their rights and that these rights are protected. In the case of Ghana, tree registration helps to increase the confidence of farmers, but scaling this effort is costly. To cover these costs, it is suggested that public entities, such as the Forestry Commission, play a supportive role. And to increase the willingness of farmers to adopt agroforestry, it is important to improve extension services and to ensure that farmers receive consistent information and advice on agroforestry. Local presence is crucial to create trust, and companies must dedicate the necessary time and resources to this. Individual coaching of farmers on agroforestry practices is considered effective, but is difficult to scale.

Providing financial incentives to adopt agroforestry can be helpful, but this is costly to scale. Moreover, these incentives are normally paid only for a short time. It is uncertain for how long they are required, what forms alternative encouragement (beyond the project) could take when incentives are no longer available, and whether farmers would continue to adopt agroforestry when financial incentives end. There is an interest among companies to pilot various PES models.

Cooperatives are key institutions, and their capacity needs to be built so they can play an effective role in promoting agroforestry and delivering services. Further, cooperatives could contribute to aggregating diverse products from agroforestry and finding markets for them.

There is no one-size-fits-all approach: agroforestry interventions need to be specific to their context. The needs assessment involved in this can be costly. In selecting farmers for agroforestry adoption, it is suggested that companies prioritize farmers who are motivated and who cultivate farms that have generally old (i.e., less productive) cocoa trees and who may be interested in integrating agroforestry as part of farm rehabilitation.

Female farmers might need different supports and incentives than male farmers, considering their smaller land size and limited access to labour and education. Integrating gender considerations into the design of projects pays off. Cases show that when gender inequality is explicitly addressed, women's empowerment follows.

Operating shade and companion tree nurseries as viable businesses is difficult, and the quality of the seedlings is not always good enough. Shade tree species that are difficult to grow by the communities in the village nursery should be acquired from professional nurseries that obtain seeds from well-known and respected organizations; however, increasing the availability of different tree species at these nurseries can be a challenge.

Climate change has led to irregular rainfall, which makes it difficult to determine the best time to plant trees.

Chapter 4.
Reflections and recommendations

The case studies provide insights into the strategies, challenges and lessons of private-sector agroforestry initiatives. This chapter reflects on these findings and provides recommendations specifically targeted at companies for further improving their agroforestry approaches. Chapter 5 provides recommendations for the wider sector.

The projects discussed here all combined multiple strategies, going beyond the simple distribution of tree seedlings, and acknowledging the range of factors that influence agroforestry adoption. It is interesting to note that most companies covered in this report promote a higher tree density than what is recommended by national authorities. The DAF model of HALBA acknowledges the need to look at tree composition at different stages of the farm: tree densities and canopy cover (through pruning), are adjusted over time, with significantly higher tree densities at establishment that are reduced as the trees mature.

The agroforestry strategies reported here tend to focus on planting new trees, instead of also investing in the maintenance of existing trees on farms or encouraging farmer managed natural regeneration (FMNR). A recent study by Kouassi et al. (2023) highlighted the limited success of tree-planting programmes in increasing timber stocks in cocoa landscapes, and advocated for investment in training in FMNR and silvicultural practices. At the same time, fruit trees often form a large part of agroforestry systems adopted by farmers, and natural regeneration is less possible for these species. The focus on tree distribution is also reflected in the targets that companies set and the indicators for reporting such as those of the Cocoa & Forests Initiatives.

For projects with a carbon component, existing trees are less attractive because they do not count towards additional carbon capture (see the HALBA case study, Annex 4). This may become more of an issue in the future, as more companies seem to be interested in the carbon component of agroforestry. Both insetting and offsetting

of carbon emissions through agroforestry are hot topics and many companies are exploring the possibility of using agroforestry programmes to achieve their climate commitments, or for access, together with farmers, to the voluntary carbon market. It is important for the sector to keep a critical perspective on how this can provide equitable benefits to farmers and meaningful contributions to the environment, and to prevent it from increasing costs or risks for farmers. Moreover, alignment between public climate programmes and private carbon projects is urgently needed.

Recommendation: **Agroforestry strategies should include the natural regeneration of trees instead of focusing only on distributing tree seedlings. Companies should also pay sufficient attention to the measures that are needed to encourage farmers to maintain the existing trees on their farm, as explained in the EFT|BBF case study (Annex 3). The commitments and monitoring frameworks of joint initiatives (e.g., CFI) may need to be revised to enable and encourage agroforestry through natural regeneration.**

In their reports, the companies do not refer much to differences between farmers in terms of preferences and livelihood assets, or to how they take these differences into account in targeting households. There may be an opportunity for strategies that are more tailored to different groups of farming households, and for understanding which farmers may be willing and able to adopt agroforestry. Segmentation has emerged as a valuable approach that can improve the effectiveness and impact of farmer support programmes, but it has not received much attention in the context of agroforestry. No single segmentation strategy is best, but there are basic steps and methods that can be relied on (Mason et al. 2022).

Recommendation: **Develop more tailored approaches to agroforestry promotion. The approach presented in this report, in particular the five types of livelihood capitals, may provide a valuable starting point for clustering farmers and developing a segmentation approach. Relevant clustering criteria may include human capital (e.g., age, gender, education), social capital (e.g., membership in a VSLA, CREMA or FBO), financial capital (e.g., access to VSLA, premiums), physical capital (e.g., access to shade trees seedlings, nearness to markets) and natural capital (e.g., existing shade trees, soil fertility, natural regeneration capacity, and land documentation).**

One of the key challenges for agroforestry that was noted in the case studies, and has been reported in literature, is the lack of accessible markets for agroforestry products. This can reduce farmers' willingness to adopt agroforestry, and can undermine the potential for agroforestry to increase household income. Some of the companies studied include market access as an explicit component in their agroforestry strategy by strengthening the marketing capacities of cooperatives; however, it remains a challenge.

Recommendation: **Consider markets for agroforestry products from the start, explore the possibility of cooperatives as aggregators and marketers of these products, and establish partnerships with organizations and local businesses that can help with strengthening market linkages. See the case studies of Cargill (Annex 1) and HALBA (Annex 4) for more information.**

Cargill and ETG | Beyond Beans reported a specific focus on women's empowerment as part of their agroforestry strategies. Cargill is working with women's groups to establish shade tree nurseries.

Recommendation: **The integration of gender into agroforestry strategies is important in order to accommodate the different needs and priorities of men and women and to promote women's empowerment. Linking agroforestry programmes with those on gender, as done by Cargill, for example, can help to integrate the necessary gender perspectives and expertise into agroforestry interventions.**

However, since several companies report that it is difficult to manage these nurseries as viable businesses, there may be a risk that benefits to women will not last or that women will not be sufficiently reimbursed for their efforts.

Recommendation: **Companies should conduct a more thorough analysis of the business potential of shade tree nurseries and find ways to develop a sustained demand for the seedlings; for example, by ensuring that multiple agroforestry programmes source from the same local nursery, rather than each setting up their own.**

Alternatively, companies may need to acknowledge that their shade tree nurseries cannot run as businesses, and find other sources of funding to keep them operating as a service to farmers (e.g., through long-term funding for cooperatives to provide this service). In the latter case, they should be mindful of the expectations among nursery operators regarding profitability and income, as well as the impact of such an approach on the financial viability of other nurseries in the landscape.

Generally, companies report that the willingness of farmers to plant and maintain trees on their farm remains low. Figure 2 indicates some of the factors that may limit the adoption of agroforestry, including those relating to the agroforestry model itself. For example, by ensuring immediate and clear benefits, adoption may improve. This can be done through PES (ETF|BBF), by focusing on improving access to food as an immediate benefit (HALBA), or by ensuring that increased tree cover also contributes to soil health through the effective composting of biomass (Tony's Chocolonely).

Recommendation: **Explore ways to increase the immediate benefits of agroforestry and make it easier to adopt. The features presented in Figure 2 — relative advantage, compatibility, complexity, trialability and observability — can guide these actions.**

Many of the agroforestry successes that are reported in this study, and in company reporting, are based on short-term projects. This highlights the importance of investing in structures and processes that last beyond project cycles, and that eventually may be able to scale up agroforestry independently of projects. Investing in cooperatives' capacities and services, which all companies report doing, is a good example.

Recommendation: **Strengthen the role of cooperatives in agroforestry promotion and in support for their members in a sustainable manner, to last beyond the duration of projects. The case of Tony's Chocolonely illustrates how long-term engagement and higher cooperative contributions can help cooperatives provide agroforestry support as a structural service to their members.**

For most major cocoa and chocolate companies such projects, which provide more intensive agroforestry support, reach only a small subset of the farmers in their supply chains. Also, many farmers are not linked to cooperatives or organized in any other way, and a large part of cocoa is still being purchased through indirect supply chains (Renier et al. 2023) This means that the case studies do not necessarily represent what is happening more broadly in cocoa landscapes in West Africa. However, information on the current scope of agroforestry programmes and the extent of agroforestry adoption across landscapes in West Africa is lacking.

Recommendation: **Share key information about agroforestry programmes and projects, to assess the extent to which different areas and farmer groups are being reached, to identify gaps and prevent overlap within landscapes. In doing this, consider data ownership and ensure that policies are in place to prevent the misuse of data.**

Recommendation: **Companies should continue to share lessons, challenges and failures regarding agroforestry promotion, to learn from each other and strengthen agroforestry programmes, including those of government extension agencies.**

Moving forward: Perspectives on agroforestry

In the course of this study, several issues arose that reveal different and sometimes conflicting perspectives on agroforestry. These raise important questions for further discussion.

Defining agroforestry and agroforestry commitments: For policy development, joint learning and accountability, it may be important to have universally agreed definitions of agroforestry with minimum requirements. At the same time, there is a risk that developing such definitions will lead to universal requirements being pushed onto cocoa farmers and their landscapes. Moreover, companies are increasingly under pressure by civil society groups and their consumers to source all their cocoa from agroforestry systems. Although this can lead to more widespread investments in agroforestry and more support for farmers, it also may lead to companies persuading or requiring farmers to adopt pre-defined agroforestry practices.

Different perceptions and perspectives: Agroforestry approaches should be shaped by stakeholders in producer countries, such as farmer groups and government agencies, rather than by international companies. At the same time, this study found that companies tend to promote more diverse agroforestry models than those promoted by national government agencies in West Africa. There are concerns that the simpler agroforestry models cannot sufficiently contribute to a sustainable cocoa sector.

Business case of agroforestry: The business case of agroforestry — how costs and benefits work out in the long term for the farmer — is not always clear and this is a key concern for farmers and the various actors in the cocoa sector. However, it is important to acknowledge that the current business case of monoculture cocoa does not take into account its true costs. Cocoa agroforestry may not immediately appear as more beneficial to farmers, since its benefits are not always reflected in direct financial value. As long as there is no system in place to compensate farmers for these public benefits, it may not be possible to carry out an accurate cost-benefit analysis on agroforestry systems.

Chapter 5.
Suggestions for collaborative action

This chapter presents a long-term perspective for collaborative action to promote agroforestry at scale. It also proposes a joint research agenda on cocoa agroforestry.

A vision for collaboration

In the case studies annexed to this report, agroforestry is promoted mostly through companies' individual projects, and although they achieve interesting results, they are limited in their ability to scale up. Moreover, fragmentation and lack of coordination can lead to inefficient use of resources and duplication of efforts (Bernard et al. 2019). Within producer countries, government agencies and civil society organizations, including farmer organizations, have a leading role in creating the enabling environment for farmers to adopt agroforestry. But private companies can also contribute, and they have the responsibility to be part of landscape and sector-wide approaches, by aligning with and contributing to such collaborative efforts. This requires going beyond achieving commitments within their own supply chain, and working to transform the entire cocoa sector.

Such a collaborative approach would be an opportunity to reframe agroforestry as a farmer-centric, locally owned solution (Mawutor 2022). Farmers and their organizations need to be at the core of formulating goals for their landscapes and identifying priorities for collective action. Private and public actors should shift away from convincing, incentivizing or persuading farmers to adopt agroforestry, and instead work jointly with them to remove barriers and create the necessary supports so that farmers and communities can decide on and implement their own agroforestry approaches. This also requires addressing power imbalances and strengthening farmers' and communities' position in decision-making at the landscape and national level.

Although this report focuses on private-sector initiatives, it is important to acknowledge that there are large-scale government programmes that promote agroforestry in producer countries, such as the Ghana Cocoa Forest REDD+ programme, as well as joint efforts such as the Cocoa & Forests Initiative (CFI). However, so far private-sector alignment with government programmes seems to be limited. Moreover, although the CFI has commitments on agroforestry, it has not yet provided a large push for collective action (Renier et al. 2023).

There is a need for better alignment and collaboration and for the greater involvement of farmers in shaping the agroforestry agenda. Two initiatives could be explored at the landscape and national level to further strengthen collective action on agroforestry: the establishment of landscape-level agroforestry partnerships, and the development of a national agroforestry policy or strategy.

Landscape-level agroforestry partnerships

Such partnerships can encourage stakeholders to work together to promote agroforestry at the landscape level, combining efforts and resources, looking beyond individual supply chains and including off-farm areas that may benefit from restoration. Although landscape initiatives exist under various programmes, such as the CFI, a partnership that focuses on agroforestry may provide a more pragmatic plan for collaboration, which can fit under existing landscape collaborations such as the Hotspot Intervention Areas and community resource management areas (CREMAs) in Ghana.

Through the partnership, key actors can jointly define landscape-level ambitions for locally adapted agroforestry models. In this collective effort, it will be important to support farmer-based organization to develop their own agroforestry solutions, rather than requiring them to implement the initiatives of companies and other stakeholders (see Box 3). There is also an opportunity to strengthen the role of local management structures, such as the CREMAs in Ghana, to take a stronger position in shaping the agenda for the integration of trees in their landscapes.

Box 3. A bottom-up strategy for promoting agroforestry: Ecookim

Ecookim is a union of cooperatives located in several regions of Côte d'Ivoire. It has developed its own agroforestry programme instead of only taking part in a private initiative. Its Ecogreen programme is funded partly by organic and fair-trade premiums and partly by partners (buyers). Launched in 2021, it is implemented in the field by a technical partner, FOA, who trains members of the cooperatives to be coaches (*producteurs relais*). Most of the programme activities consist of the production and distribution of agroforestry seedlings to member farmers. Seedlings are planted in agroforestry plots to achieve a density of 15–20 trees/hectare. They can also be planted in reforestation plots at much higher densities. In 2022, the Ecogreen programme aimed to distribute 445,000 seedlings for agroforestry and 120,000 for reforestation. After consultation with farmers, seven species were selected for agroforestry. They include local forest trees (*fraké, framiré*), local forest fruit trees (*akpi, kplé, petit cola*) and exotic quick-growth trees (*Cedrela* and *Acacia mangium*). Monitoring has shown a survival rate of almost 85% in most cooperatives.

In creating an agroforestry partnership, it will be important to bring together the knowledge and resources of a range of stakeholders, paying specific attention to the needs and preferences of farmers. In such a partnership, farmers, NGOs, public and private actors could work together, which also means that companies could combine their resources and efforts and target all farmers in the landscape with an interest in agroforestry, rather than only those in their supply chains. This type of collaboration could lead to joint assessments, joint research and data collection (e.g., restoration opportunities, climate vulnerability assessments), as well as joint activities such as nursery establishment and training for farmers.

National agroforestry strategy

Having a common strategy or policy that brings together different government departments can help to eliminate legal and regulatory restraints, enable alignment of efforts, and create the necessary incentives for agroforestry. Since agroforestry provides public benefits and services that may not be valued by the private market, public policies can support approaches that reward farmers for these positive outcomes and compensate them for the delay in returns from agroforestry systems, such as timber harvest or carbon payments (Buttoud 2013). The joint development and implementation of such a national initiative with all key actors, and with a focus on farmers and communities, can bring more alignment among stakeholders and ensure that the strategy is shaped by the needs and rights of cocoa farmers and communities.

India and Nepal are among the few countries in the world that have adopted a national agroforestry policy. Ghana has a national agroforestry policy that stems from 1986, but it does not appear to be a key document guiding agroforestry promotion in recent years (Bernard et al. 2019). However, the current interest and investments in agroforestry in Ghana's cocoa landscapes may provide an opportunity to revive and review this policy.

A national policy or strategy can provide a common framework for and a commitment to agroforestry among stakeholders, including different government departments, that have an interest in the various goals that agroforestry can help achieve. These include climate and biodiversity commitments, sustainability of the cocoa sector, livelihood resilience, increased timber resources, and greater availability of food and firewood. The policy or strategy can guide coordinated efforts at the national level, such as creating an enabling regulatory context (e.g., strengthened forest law enforcement), exploring joint financing options (e.g., climate finance), facilitating effective monitoring, and guiding research and learning (Box 4).

In the case of Ghana, particular attention could be paid to structural solutions to tree tenure and strengthening community-based resource management structures. This is important not just to promote the adoption of agroforestry, but also to ensure more just and inclusive governance of the landscapes where cocoa is produced (Maguire-Rajpaul et al. 2022).

A national agroforestry policy or strategy may benefit from further elaboration at the subnational level, where local specifics can shape the approach, including environmental and climatic conditions and local access to markets for agroforestry products. Moreover, subnational elaboration allows for better alignment with local needs and concerns, and stronger involvement of farmers, their organizations and community groups in the decision-making process.

Ultimately, to achieve agroforestry at scale and to reach its full potential in contributing to resilient landscapes, livelihoods and cocoa supply chains, it is important for all actors to rally behind a vision for collaboration and to work together to achieve it.

Box 4. A joint agenda for research and learning

The joint development of such an agenda on cocoa agroforestry — with farmer groups, private companies, governments, civil society and academics in producer countries and internationally — is needed. This could contribute to developing agroforestry models that provide multiple benefits for cocoa farmers and their landscapes. Moreover, a joint agenda could help to encourage further learning and exchange between countries; e.g., Ghana and Cote d'Ivoire.

This report identifies some knowledge gaps, both those raised by companies and those that arose during the analysis of the company cases:

- A better understanding is needed of which tree species provide which benefits to farmers and which services to the landscape and are adapted to which climatic zones.
- Monitoring only tree planting and survival does not reveal much about whether agroforestry is delivering all of its benefits. There is need for more meaningful monitoring to capture the benefits of agroforestry (beyond planting) that might become visible only after several years. Better understanding is needed of what can be monitored in the short term and which key performance indicators capture long-term change.
- The most feasible way for cooperatives to offer agroforestry services to farmers (nurseries, coaching, pruning, market linkages for non-cocoa products) needs to be better understood, as well as what cooperatives need in order to do this effectively.
- The question of whether agroforestry has the potential to contribute to food security and improve access to firewood is a big issue in the communities, as is the extent to which different agroforestry systems can help to address this. The risks of chemical use in cocoa agroforestry for food security also need to be studied.
- Better understanding is needed of how farmers perceive that agroforestry reduces or increases risks.
- More information is needed on the extent to which lack of access to finance is a barrier to agroforestry adoption, and how entities such as Village Savings and Loan Associations can remove this barrier.
- Much more information is needed on multipurpose nurseries, including the business case for them. Information on how to grow different species is needed, as is a better understanding of the best locations for such nurseries and how to improve the availability of the seeds.
- Current agroforestry strategies and incentives focus on planting new trees, but other incentives that could motivate farmers to maintain existing trees and encourage natural regeneration need to be studied.
- The role of cooperatives in marketing agroforestry, and what is needed to make them effective in this role, needs to be studied. This includes the challenges and barriers they face, the assistance they need and how they can best build partnerships with relevant organizations and local businesses.

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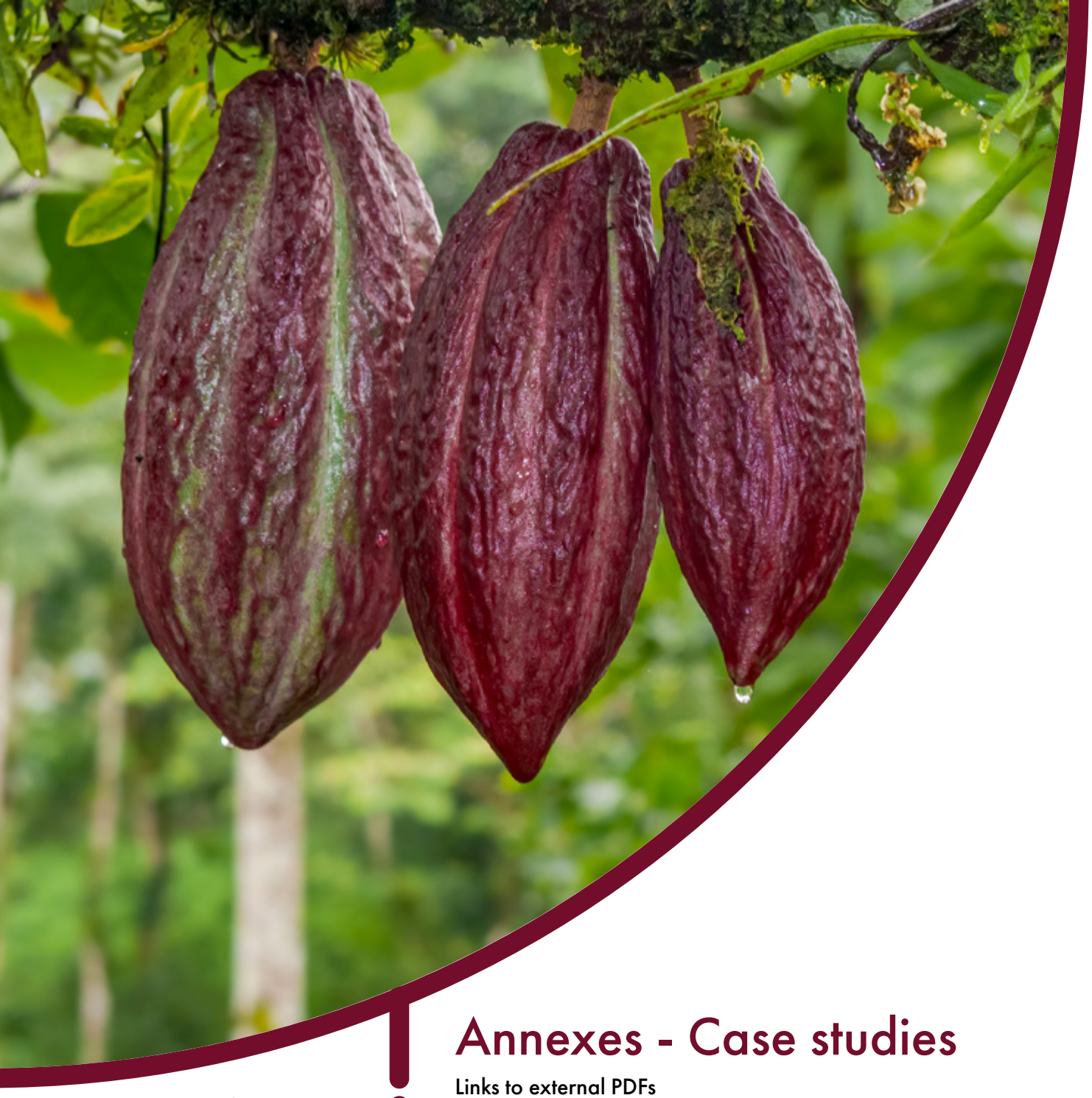

Annexes - Case studies

Links to external PDFs

Annex 1. Cargill

Annex 2. CÉMOI

Annex 3. ETG | Beyond Beans

Annex 4. HALBA

Annex 5. Tony's Chocolonely

Annex 6. Touton

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