KINOMÉ

Vade-mecum

Review of initiatives and tools to promote the coexistence of forest conservation and environmentally friendly cocoa development in West Africa

April 2023

Study conducted as part of the PAPFor programme, in collaboration with WABiLED.
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PAPFor

agreco

Contacts

Yohann FARE
Agroeconomist
Email: yohann.fare@kinome.fr
consulting@kinome.fr

Damien Kuhn
Forestry Engineer
Email: consulting@kinome.fr

Félicie FORGEOIS
Consultant
Email: felicie.forgeois@kinome.fr

Campus du Jardin Tropical 45 bis avenue de la Belle Gabrielle, 94736 Nogent-sur-Marne cedex, France
www.kinome.fr

Title

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Acronyms

AF	:	Agroforestry
AFD	:	French Development Agency
AFI	:	Accountability Framework Initiative
AGUIPEX	:	Guinean Agency for the Promotion of Exports
ANADER	:	National Rural Development Support Agency (Côte d'Ivoire)
ARCC	:	Cacao Coffee Regulatory Authority (Côte d'Ivoire)
ARS	:	African Regional Standards
AVSF	:	Agronomists & Veterinarians Without Borders
AWAC	:	Walloon Air and Climate Agency
BCC	:	Coffee and Cocoa Exchange (Côte d'Ivoire)
CARI	:	Central Agricultural Research Institute (Liberia)
CCC	:	Cocoa Coffee Council: The Ivorian state body responsible for regulation, stabilization and development of the coffee and cocoa sector since 2012.
CCCDF	:	Coffee-Cacao Producers Development Fund (Côte d'Ivoire)
CHED	:	Cocoa Health and Extension Division (CHED) of Ghana Cocoa Board
CILSS	:	Interstate Committee for Drought Control in the Sahel
CIRAD	:	Centre for International Cooperation in Agricultural Research for Development
CLMRSs	:	Child Labour Monitoring and Remediation Systems
CNES	:	National Centre for Space Studies
CNRA	:	National Centre for Agricultural Research (Côte d'Ivoire)
COCOBOD	:	Ghana Cocoa Board
CRIG	:	Cocoa Research Institute of Ghana
CRIN	:	Cocoa Research Institute of Nigeria
CSSL	:	Conservation Society of Sierra Leone
CSSVD	:	Cocoa swollen shoot virus disease
CST Forest	:	Forest Scientific and Technical Committee
CTA	:	Technical Centre for Agricultural and Rural Cooperation
DAF	:	Dynamic agroforestry (in French: Agroforesterie Dynamique)
ECOWAS	:	Economic Community of West African States
FACE	:	Fund a child's Education (International)
FAO	:	Food and Agriculture Organization
FAOSTAT	:	Food and Agriculture Organization Statistics
FCPF	:	Forest and Carbon Partnership Facility
FFEM	:	French Global Environment Facility
FFI	:	Fauna & Flora International
FIP	:	Forest Investment Plan
FMARD	:	Federal Ministry of Agriculture and Rural Development
FPS	:	Farmer Producers' Symbol
FRC	:	Cocoa Coffee Regulation and Control Fund (Côte d'Ivoire)
FSC	:	Forest Stewardship Council
FT	:	Fair Trade
GAP	:	Good Agricultural Practices
GCFRP	:	Ghanaian Cocoa-Forest REDD Program
GHG	:	Greenhouse Gas
GIZ	:	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICCO	:	International CoCoa Organization
ICRAF	:	International Center for Research in Agroforestry (better known as *World Agroforestry*)
IDDRI	:	Institute for Sustainable Development and International Relations
IITA	:	International Institute of Tropical Agriculture
ILO	:	International Labour Organization
IRAD	:	Agricultural Research Institute for Development (Cameroon)

IRAG	:	Agronomic Research Institute of Guinea
IRCC	:	Café Cacao Research Institute
ISCO	:	National Initiatives for Sustainable Cocoa (European Movement)
ISO	:	International Organization for Standardization
ITK	:	Agricultural Technical Route
IUCN	:	International Union for the Conservation of Nature
LACRA	:	Liberia Agriculture Commodity Regulatory Authority
LISUPED	:	Liberia Initiative for Sustainable Peace and Development
LNACEA	:	Liberia National Cocoa and Coffee Exporter Association
LPMC	:	Liberia Produce Marketing Corporation
MAF	:	Ministry of Agriculture and Forestry (Sierra Leone)
MEA	:	Millennium Ecosystem Assessment
MEFSIN	:	Ministry of Economy, Finance and Industrial and Digital Sovereignty (France)
MGE	:	Guinean House of the Entrepreneur
NC3P	:	National Cocoa Sector Public-Private Platform (Liberia)
NCDB	:	National Cocoa Development Board (Sierra Leone)
NDC	:	National Defined Contribution
NGO	:	Non-Governmental Organization
NIRSAL	:	Nigeria Incentive-Based Risk Sharing System for Agricultural Lending
NOFNA	:	Notre Forêt Notre Avenir (local Côte d'Ivoire's NGO)
NWFP	:	Non-Wood Forest Products
ONCC	:	National Office of Coffee and Cocoa (Cameroon)
PAPFor	:	Support programme for the conservation of forest ecosystems in West Africa
PINA	:	National Investment Plan for Agriculture (Côte d'Ivoire)
PMB	:	Produce Monitoring Board (Sierra Leone)
PPREF	:	Policy of Preservation, Rehabilitation and Extension of Forests (Côte d'Ivoire)
RA	:	Rainforest Alliance
RSPB	:	Royal Society for the Protection of Birds
SCNL	:	Society for the Conservation of Nature of Liberia
SLARI	:	Sierra Leone Agricultural Research Institute
SLIEPA	:	Sierra Leone Investment & Export Promotion Agency (Sierra Leone)
SME	:	Small to Medium Enterprises
SNDI	:	National Strategy Against Imported Deforestation
UE	:	European Union
UEMOA	:	West African Economic and Monetary Union
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
US	:	United States (of America)
USAID	:	US Agency for International Development
WABiCC	:	West Africa Biodiversity and Climate Change
WABiLED	:	West Africa Biodiversity and Low Emissions Development
WCF	:	World Cocoa Foundation
WCF	:	World Chimpanzee Foundation (WCF Chimp)
WFCL	:	Worst Form of Child Labour
WHH	:	Welt Hunger Hilfe
WHO	:	World Health Organization
WWF	:	Worldwide Fund for Nature
YVEO	:	Yacoli Village Open School (national Côte d'Ivoire's NGO)
ZID	:	Zero Imported Deforestation (European Union Law)

Useful definitions

Agroecology: Theorized in the 1970s and 1980s by ecologists like Altieri and Gliessmann, agroecology is a set of practices combining agronomy and ecology. Agroecosystems must guarantee a productive function as well as the sustainability of a set of ecological services (SANIAL, 2019).

Agroforest: original wooded formation in which the fauna and flora composition are managed by the local human population(s), with the interest of meeting their vital needs (food, energy, building materials, etc.). Although canopy area and tree size may correspond to the definition of a forest, anthropogenic origin and management with subsistence or cash crop classifies agroforestry in rural and non-forestry areas

Agroforestry: according to ICRAF and CTA (1993), *agroforestry is the voluntary integration of trees into agricultural landscapes, in any spatial arrangement or temporal sequence, to obtain benefits from the ecological and economic interactions between these different components*. This definition covers all agricultural practices that, on the same plot, associate trees (in all their forms: hedges, alignments, groves, etc.) with an agricultural and/or livestock culture (Agroforestry, 2022). In the cocoa sector, some producer countries have been able to give more precise definitions to agroforestry, sometimes with details on the density of shade trees per hectare or that of cocoa trees.

Cocoa as a commodity: basic everyday consumption product (here cocoa) with qualities defined and recognized by the consumer. Commodity cocoa is placed on international markets (in terms of price) and is often transformed into a blend.

Cocoa as a specialty: cocoa recognized for its superior traceability allowing, among other things, to know the price paid to the producer. Specialty cocoa generally has descriptive and superior physical and organoleptic properties allowing it to be sold in a separate batch for its specific quality.

Ecosystem services: benefits that people derive from ecosystems and are grouped into four broad categories: (i) supply, such as food production and water; (ii) regulation, such as climate and disease control; (iii) support, such as nutrient cycles and crop pollination; and (iv) cultural, such as spiritual and recreational benefits (MEA, 2005).

Forests: The United Nations Food and Agriculture Organization (FAO) defines forests as land occupying an area of more than 0.5 hectare (5,000m^2) with trees reaching a height of more than 5 meters and a forest cover of more than 10%, or with trees capable of meeting these criteria. The definition excludes land with the predominant purpose of agriculture or urban. The forest includes a stand of trees, shrubs and hedges. More generally, the term also refers to the ecosystem grouping the flora (which delimits the geographical space) and the fauna that live there (temporarily for migratory species and continuously for the species of which it constitutes the natural habitat). This space has a particular symbiotic function.

Land area: index corresponding, for a given tree, to the trunk section area, generally measured at 1.30 meters from the ground. The total or average land area of a given area can be calculated as the sum of the land areas of all the trees in that area; it is usually expressed in m²/ha.

Non-Wood Forest Products (NWFP): Goods derived from forests that are tangible and physical objects of biological origin other than wood (FAO)

Protected area: a clearly defined geographical area, recognized, dedicated and managed, by legal or other means, to promote the long-term conservation of nature, ecosystem services and related cultural values (IUCN definition).

Traceability : Traceability is the ability to trace all processes, from the supply of raw materials to production, consumption and disposal. In some cases, it is interpreted as the ability to verify the history, location or application of an item through documented and recorded identification.

Executive summary

Cocoa production systems' transition towards greater sustainability is a concern widely shared today by governments, industry and civil society, in particular to combine forest resource conservation (by stopping all deforestation related to cocoa), climate regulation, and social well-being of cocoa farmer populations (by improving income or access to goods and services provided by ecosystems, such as access to non-timber forest products or microclimate regulation).

In West Africa, the cocoa sector faces many challenges. Producers' low income does not allow sustainable sector development. Farmers have a low capacity to save and reinvest, thus limiting plot maintenance to the strict minimum. Apart from a plantation's first years of production, yields are generally low and orchards tend to wither away. The search for fertile land leads to development of new forest areas. Coupled with rural demography (of endogenous and exogenous origin), this has sometimes led to real dynamics of "pioneer front." Sustainable cocoa (ecologically, economically and socially sustainable) tries to respond to the multiple sector challenges. Part of industry's and governments' commitment (corporate sustainability policies or collective commitments such as the Cocoa and Forest Initiative), this production system is increasingly framed by laws, standards and labels defining guidelines and the roles and responsibilities of each actor in the chain. The two main standards are ISO 34101 and ARS 1000. The main labels are those from fair trade, Rainforest Alliance and organic farming, each with a particular angle. Sustainability also requires deployment of technical guidance appropriate to agronomic plans, market access or access to finance.
In addition to standards and labels, the new regulation adopted by the European Commission[1], known as avoided deforestation, provides mandatory due diligence rules for operators who will place on the EU market specific commodities associated with deforestation and forest degradation, including cocoa. Its objective is to ensure that only legal (in accordance with the current legislation of the country of origin) and "zero deforestation" products are allowed on the EU market. Therefore, PAPFor area cocoa producers must be able to adapt to this regulation's requirements to develop value chains compatible with European market supply.

The PAPFor project aims at protection and enhancement of transboundary protected areas of West African rainforest ecosystems (Guinea, Côte d'Ivoire, Liberia, Sierra Leone and Nigeria). To help improve local communities' incomes, the managers of the different landscapes encourage development of income-generating sectors on protected areas' periphery. Cocoa is one of the crops considered. Providing a *vade-mecum* on sustainable cocoa aims to allow operators to access information useful in supporting cocoa projects towards greater sustainability and to eliminate any negative impact on biodiversity.

This report highlights sustainable practices following a review of the existing literature, consultation with various experts and analysis of field feedback. This exercise indicates that many sustainability practices exist but are to be adapted according to the areas and the previous cocoa history (existence or absence of old orchards to be rehabilitated among others):

- Main good practices: replacement of non-productive cocoa trees, regular plot maintenance (cleaning, planning, cutting, pest and disease management), soil management (composting, mulching, etc.), agroforestry (association of local species, shade management and NTFPs), agroecology (management of natural resources, intercropping, permanent cover)
- Income diversification: through rational natural resource use and/or diversification of crops and tree species to increase producers' resilience in the face of epidemics, etc.

[1] Regulation adopted in December 2022: REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the making available on the Union market as well as export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010

Introduction

At the beginning of the 20th century, West Africa was home to a forest area covering 1.5 million km² (about 150 million ha). Today, only 20% of this area remains (loss of 94% of forest cover in Côte d'Ivoire over the last 60 years). It is in danger because it is constantly exploited and cleared by local populations who need timber and arable land (IUCN, 2005). The evolution of West Africa's forests is illustrated in the figure opposite.

In this landscape, agriculture, including cocoa, plays an important role alongside other factors such as logging, mining, bushfires, etc.

Cocoa cultivation is one of West Africa's most important resources, especially for the world's main cocoa producers: Côte d'Ivoire (40% of the world's cocoa production), Ghana (15%), Nigeria (5%) and Cameroon (5%) (FAOSTAT, 2021). In Ghana and Côte d'Ivoire, it supports not only farmers (1.5 million farmers derive 70 to 100% of their income from it), but also the economy (68% of agricultural export revenues in Côte d'Ivoire, which is equal to 10% of the national economy) (WORLD BANK, 2019). This "revenue" culture (cash crop) also contributes to local development (financing needs, such as education and health) while being a source of wealth and work.

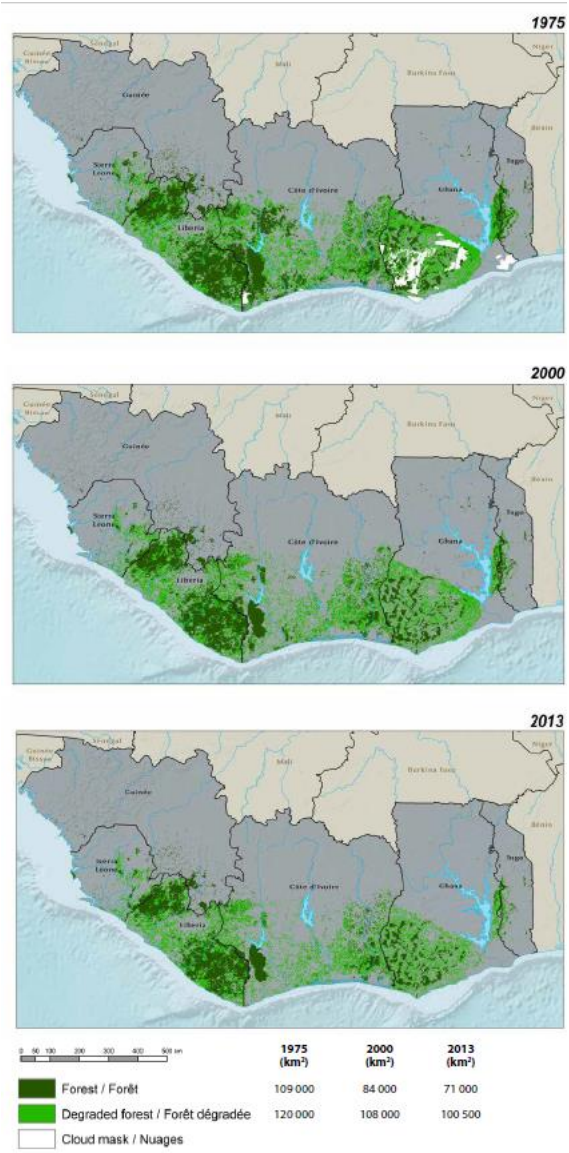


Figure1: Coverage of dense and degraded forest from 1975 to 2013; source: CILSS 2016

However, the international value chain structure and low export price lead to low incomes, estimated at 50 cents per day on average (Mighty Earth, 2017) and therefore to planters' inability to invest in labour, fertilizers and equipment, which are useful for maintaining satisfactory yields over the longest term possible. On the contrary, to maximize yield in less time, cocoa trees are grown in full sun; i.e., without shade. The fields are quickly depleted and are abandoned in favour of new forest areas (Angoran E.J., 2018, Ruf F, 1995, Tondoh et al. 2015). The consequence of loss of the farm yield or production level on a regional scale has resulted in a shift of cocoa plantations to new areas. Generally, the creation of new fields leads to deforestation (Ruf F, 1995; Gockowski and Sonwa, 2011; Amiel F, 2019b). Cocoa cultivation is therefore recognized as the main deforestation driver in this area (30% of deforestation in Côte d'Ivoire) during the expansion of cultivated areas (40% expansion of these areas over the last 20 years) (Mighty Earth, 2017).
These low incomes also lead to social challenges, including the inability to hire skilled or unskilled workers, which involves employment of children in physical or dangerous positions (use of machetes, carrying heavy loads).

Development practitioners, research centres and the private sector have identified very real solutions to these challenges but need to learn techniques and practices and also to invest in transition from current models to models that are economically, socially and environmentally viable.

PAPFor is a four-year European programme under the umbrella of ECOWAS and WAEMU. Its objective is sustainable management of protected areas and forest land as well as regional convergence on this theme. PAPFor sees cocoa as a development path for the communities of the landscapes concerned, but on a sustainable basis from the outset so that the value chains are compatible with the European regulation to avoid imported deforestation[2]. To this end, PAPFor wishes to inventory projects to support and develop West Africa's cocoa sector to understand these different projects' impacts, bottlenecks and dynamics, among them, to identify action leverage to help producers and to be able to give reference points to project actors to reduce their impacts on biodiversity.

[2] Europe is behind China, the second largest responsible actor for deforestation due to import of agricultural products. The regulation adopted in December 2022 aims to reduce its impact in terms of deforestation and forest degradation worldwide and limit greenhouse gas emissions and biodiversity loss.

1 Study context, objectives and approach

1.1 Context

PAPFor

The overall objective of PAPFor, a programme funded by the European Union (EU), is protection and enhancement of transboundary protected areas of West African rainforest ecosystems (Guinea, Côte d'Ivoire, Liberia, Sierra Leone and Nigeria).

PAPFor comes in two components:

- A "field" component 1, set up by different implementing agencies through six cross-border forest landscapes.
- Component 2 on regional convergence and integration.

Field activities are focused on 6 priority forest landscapes:

- Outamba-Kilimi-Kuru Hills-Pinselli-Soya
- Gola-Foya
- Wologizi-Wonegizi-Ziama
- Mt Nimba
- Taï-Grebo-Krahn-Sapo
- Cross River

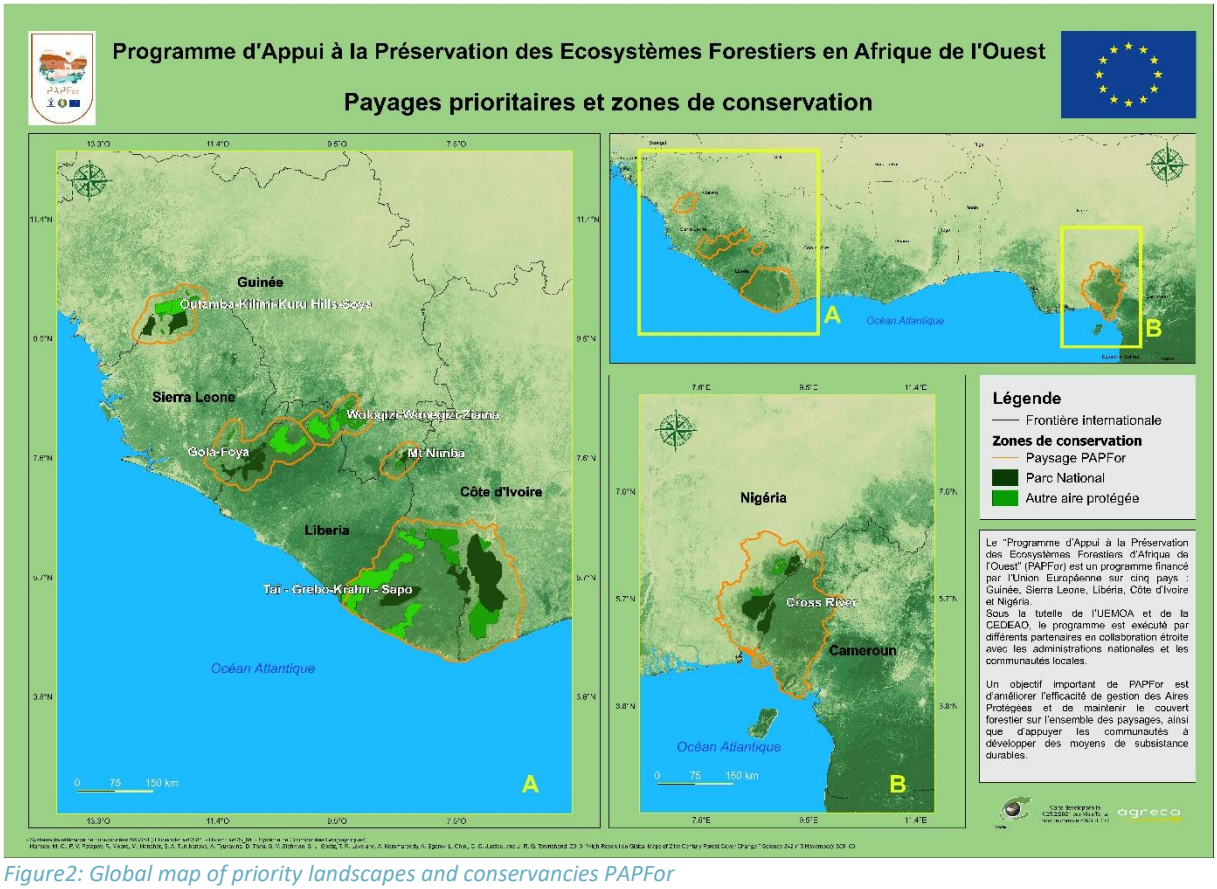


Figure2: Global map of priority landscapes and conservancies PAPFor

The WABiCC and WABiLED programmes

The WABiCC program was created to address the threats of ineffectiveness in programmes hampered by limited intra-regional coordination as well as a lack of communication and outreach to policymakers and the general public. It ended in February 2021 and continued with the WABiLED program (WABICC; 2021).

Following WABiCC, the WABiLED programme for "Biodiversity and low-emission development in West Africa" has a four-year duration and is funded by the United States Agency for International Development (USAID). It has three main objectives: combating wildlife trafficking and improving great ape conservation; reducing deforestation, forest degradation and biodiversity loss in key transboundary forest landscapes; reducing greenhouse gas emissions and increasing carbon sequestration through land use. The programme works with partners to build the capacity of networks and institutions in law enforcement, implementation of cooperation strategies and economic planning.

The level of implementation of cocoa projects in the different landscapes of PAPFor

Table 1: Level of implementation of cocoa projects in the different landscapes of PAPFor

Landscape	**Gola-Foya**	**Wologizi-Wonegizi-Ziama**	**Taï-Grebo-Krahn-Sapo**	**Cross River**
Country	**Sierra Leone Liberia**	**Guinea Liberia**	**Côte d'Ivoire Liberia**	**Nigeria Cameroon**
Partners	RSPB, SCNL, CSSL, different farmers' associations	GRET, FFI, MGE, ADCAP	GIZ, NOFNA, YVEO, Earthworm Foundation, WCF Chimpanzee, LISUPED, FACE, WHH	Wildlife Conservation Society, Cross River National Park authorities
Major Achievements	Creation of an association of producers and found economic opportunities with a premium price	Training in agroforestry, forestry and market gardening technical routes	Participatory approach to forest conservation. Search for multiple interests in the preservation and transformation of NWFP.	Decrease in hunting levels in the park Increased implementation of Good Agricultural Practices (GAP), more sustainable cocoa areas and increased wellbeing of targeted communities
Major challenges	Lack of financial means, short-term projects (4 to 5 years)	Increasing production by reducing pressure on the forest	Lack of Cocoa GAPs in the landscape and finding alternatives to logging	Obtaining seeds and plant material of good quality (from the CRIN), conservation of wildlife, propose effective

Landscape	Gola-Foya	Wologizi-Wonegizi-Ziama	Taï-Grebo-Krahn-Sapo	Cross River
Country	Sierra Leone Liberia	Guinea Liberia	Côte d'Ivoire Liberia	Nigeria Cameroon
				economic alternatives to ensure preservation Improving the effectiveness of conservation laws
Number of beneficiaries	1.766 in Sierra Leone and 105 in Liberia	??	Tens of thousands	100 communities including 2,000 inhabitants
Resource available	USAID-WABiLED and EU-PAPFor partnership, documents On the establishment of farmers' groups	Identification sheets, Image Boxes	Awareness-raising tools, inventory of cocoa production on the national park's outskirts, studies on shade tree species and agroforestry devices Suitable for cocoa farming	Use of a spatial tool for patrol monitoring (SMART tool), Questionnaire to collect primary needs (BNS) Working together with the state, farmers are an integral part of conservation
To be integrated during the next projects	Replant more in degraded areas while restoring forest areas; integrate more training.	Devote budget and time to training in purely technical aspects, support structuring and marketing to ensure economic viability	Consider the project environment (gold panning, poaching) having direct consequences on preservation Rely on customary law to introduce new regulations	Have a seed production centre to become independent Working in partnership with market players to ensure economic viability

1.2 Objectives and Expected Study Results

This study was conducted as part of component 2 and a collaboration between PAPFor and WABiLED, in a USAID-funded programme. The mission's overall objective is to provide conservation practitioners with a comprehensive set of references and tools to ensure that the 'cocoa initiatives' included in the programmes funded by the European Union and USAID in the geographical areas of PAPFor and WABiLED are as effective as possible and contribute to the conservation of Guinean forests and their biodiversity, while supporting the livelihoods of communities living around protected and conserved areas.

The study aims to analyse lessons learned and challenges of past and ongoing initiatives promoting coexistence between forest conservation and environmentally friendly cocoa development in West Africa. An important aspect of the mission was to provide an external perspective, making it possible to identify recommendations in support of EU and USAID interventions. The major forest States of West Africa were emphasised: Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana and Nigeria/Cameroon.
It must also lead to recommendations consistent with the EU regulation adopted in December 2022, aimed at avoiding imported deforestation so that the cocoa value chains developed in the PAPFor zone are eligible for the European market.

1.3 Technological approach

The assessment was undertaken in methodological steps:

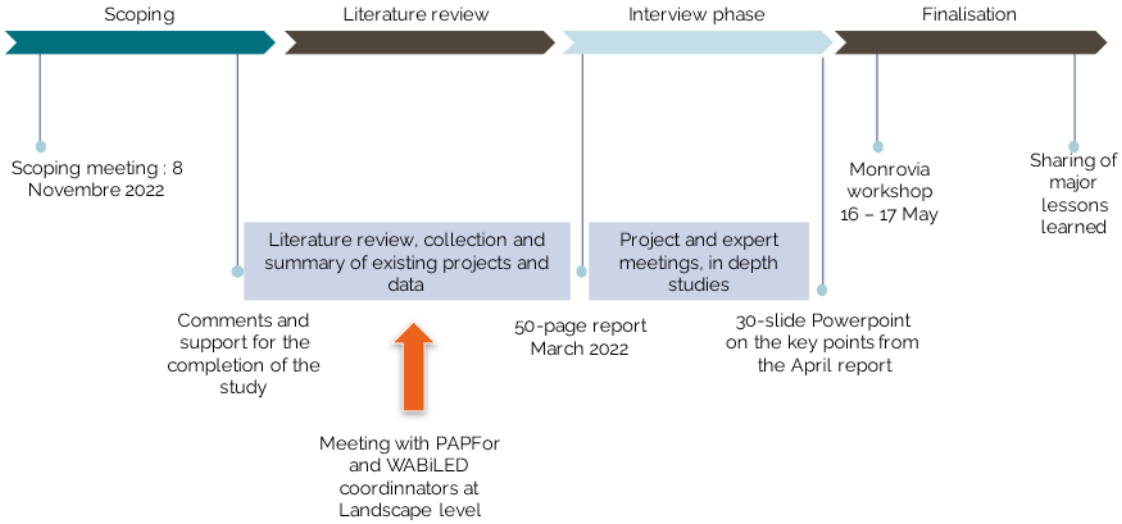


Figure 3: Methodological phases of the study; Kinomé 2023

Phase 1) Scoping

A scoping meeting was held on 8 November 2022 to ensure each of the study's stakeholders' roles and missions.

Phase 2) Bibliographic study

The bibliographic study aimed to identify useful knowledge and resources on the "sustainable cocoa" and "conservation" pairs. Thus, sites existing in the world and specifically in West Africa were inventoried, with the cocoa sector, cocoa agronomy, sustainability and environment as key themes.

Phase 3) Interview phase

A maintenance phase was added to allow each stakeholder to contribute to identifying lessons learned, challenges and major successes and also to provide their suggestions for better effectiveness of future projects. This phase also involved the use of subject-specific experts to further the analysis. Finally, it was an opportunity for the landscapes to present their practices or intentions regarding cocoa farming. This phase is exclusively in the form of telephone interviews or video conferences. The list of interviews is given in chapter 10 List of interviews conducted as part of the study. (List of interviews performed within the study)

Phase 4) Finalization

This phase aimed at analysing and summarizing the sources and then compiling stakeholder feedback to make the report easily usable by all stakeholders.

2 Cocoa sector economy

2.1 Value chain and key players

Cocoa is classified as an agricultural commodity; i.e., it is placed on international markets and a product sample is easily substitutable given standardization. Only the quantity and a few physical quality criteria are checked (in particular the size and quality of the beans, checked by the "cut test" and humidity level). There is certainly a much smaller quantity of cocoa known as specialty cocoa: it is selected on the basis of organoleptic properties, sustainable production methods or social criteria.

According to FAO data, production has steadily increased over the past five decades (Figure 4). Upstream of the chain are millions of smallholders who farm fewer than 10 ha; cocoa is generally their main source of financial income, so they are relatively specialized; paradoxically, producers are mostly structured.

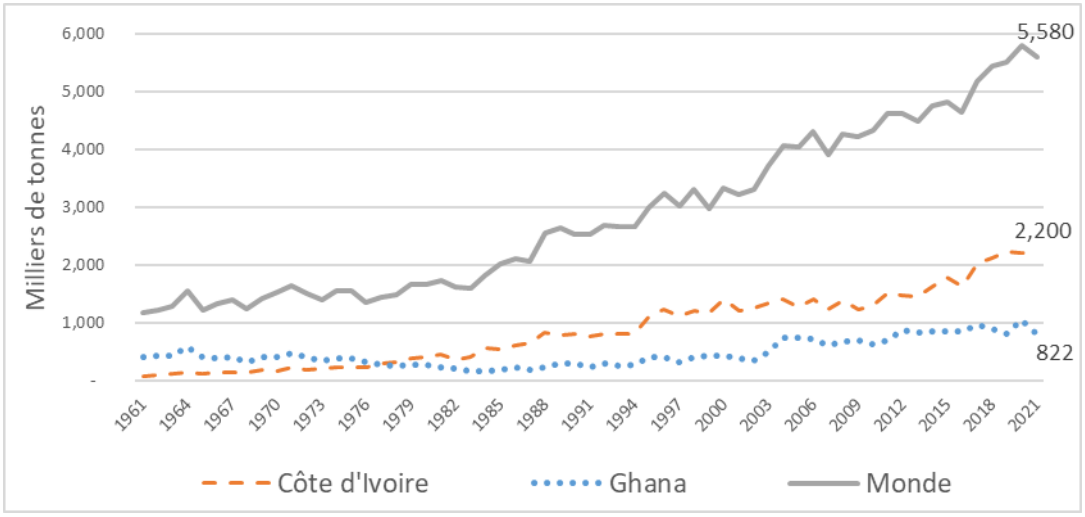


Figure 4: Evolution of cocoa production in thousands of tons from 1960 to 2021 (FAOSTAT, 2022)

Figure 5: Bottleneck in the cocoa chain (adapted from IDDRI, 2019)

The number of players has decreased at the value chain centre , which concentrates power in terms of purchasing and market share in the hands of a reduced number of players (Figure 5). For example, the four main grinders (those that process the bean) increased from a cumulative market share of 47% to 65% between 2006 and 2015 (IDDRI, 2019). Production is atomized, reduced into many units implemented by millions of small producers in the world. Atomized production, facing buyers in oligopoly, is obviously a source of imbalance. Producers hold a very small share in the distribution of the price of a chocolate bar and in the distribution of the added value.

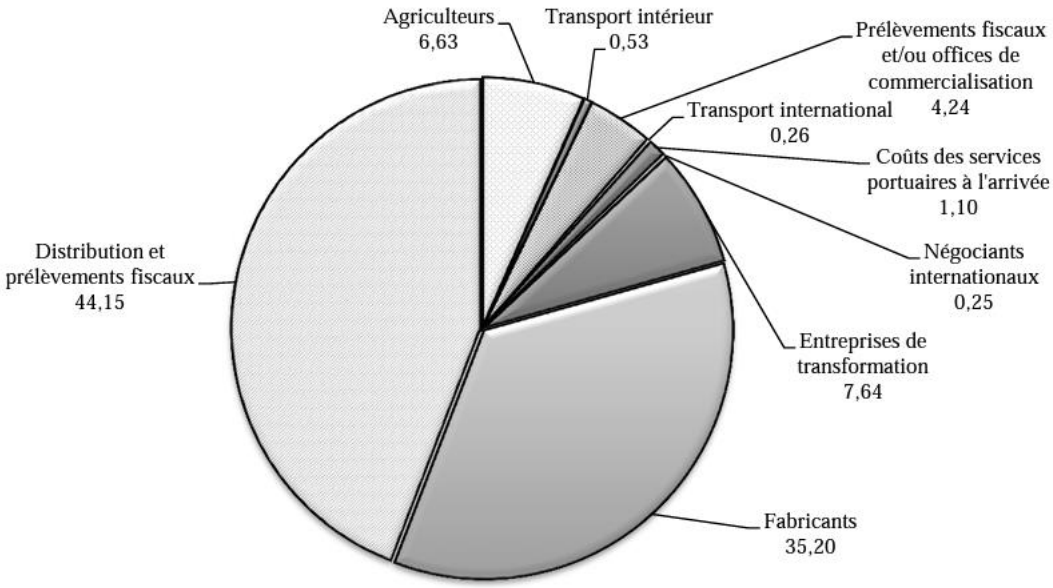


Figure 6: Distribution of the value added to a tonne of cocoa in the global value chain (Source: World Bank, 2019)

2.2 West Africa's major role

The cocoa tree, originally from Central America, is grown only in the intertropical zone. It is now present on all continents in the cocoa belt and more abundantly in West Africa where it was introduced at the beginning of the 20th century.

In 2021, the African continent produced 68% of the world's cocoa production, Asia 14%, Latin America 18% and Oceania 1%. The top five majority producing countries are Côte d'Ivoire, Ghana, Indonesia, Nigeria and Cameroon. They accounted for 84% of global cocoa areas in 2017 (FAOSTAT, 2021). In Africa, other countries cultivate cocoa in a lower proportion, including Sierra Leone, Liberia, Togo….

Figure 7: Cocoa production by state and territory in 2020, Source: FAO

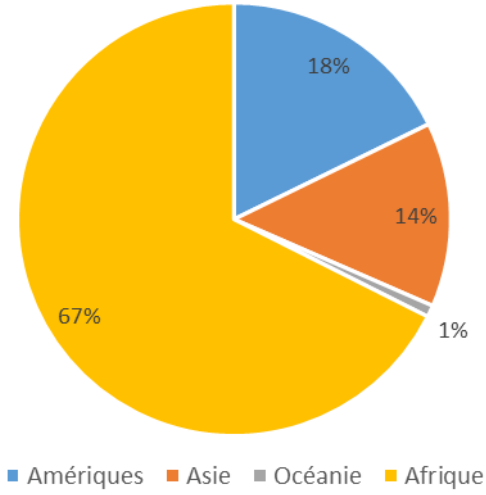


Figure 8: Global production of market cocoa in 2021; source: FAOSTAT

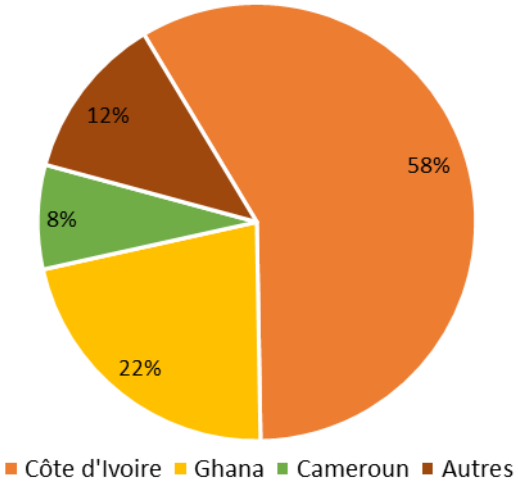


Figure 9: African market cocoa production in 2021; source: FAOSTAT

Although Côte d'Ivoire currently accounts for nearly 40% of world production, cultivation began first in the African islands of Bioko, Sao Tome and Ghana at the end of the 19th century. About 30 years later, or about 1920, African production expanded and surpassed that of Latin America. In Ghana and Côte d'Ivoire, the agricultural development objectives of the colonial powers and then the newly independent states pushed towards expansion of cocoa farming. Whether England for Ghana or France for Côte d'Ivoire, this sector was supported by the establishment of infrastructures (mostly transport routes) that allowed installation of small producers in remote places for export cultivation. The increasing commercialization of these economies (establishment of markets and taxes) also stimulated the production of this commercial culture.

The Ghanaian industry has been slowed by the effects of several coups as well as the development of the *Swollen Shoot* virus. Starting in 1970, an accelerated growth of Ivorian production was observed, in particular due to a proactive policy of President Félix Houphouët-Boigny and a fairly strong Ivorian cocoa union. President Houphouët-Boigny privileged the primary sector, especially cocoa and coffee, and allowed Côte d'Ivoire to become the giant of cocoa as we know it today (Universalis encyclopédie, 2018). Thus, from 1911 to 1978, Ghana (e.g. Gold Coast) was the first cocoa producer

in the world, followed by Côte d'Ivoire (Figure 4). Since then, these two countries remain highest in world cocoa production, even today (Figure 9).

On the other hand, the agricultural system that has worked so far in the two cocoa flagship countries is ending: the forest cover is rapidly shrinking in Côte d'Ivoire and Ghana, and migration to new fertile lands conducive to cocoa farming is becoming increasingly complex. For them, maintaining their position as the world's leading producers and conserving the few remaining forest areas are two major challenges that do not necessarily go hand in hand.
For other West African countries, the challenge is to develop the sector without reproducing this dynamic and to conserve their forests. However, part of the question is what model to put in place.

2.3 Value chain governance in selected West African countries

Depending on their cocoa history and the sector's weight in the national economy, countries do not have the same type of organization. The following table summarizes the sectoral governance by country.

	Côte d'Ivoire	Ghana	Liberia	Sierra Leone	Nigeria	Guinea
Cocoa's share of the country's exports (Workman D., 2021)	15% of GDP, 1st exported product (51.4% of national export)	1st agricultural product exported 3rd product exported (22%) (MEFSIN,2021)	5th product exported (1st rubber, diamond, gold and silver) Cocoa is a sector of opportunity, recent in the country	1st agricultural product exported (85%), 4th exported product (5%)	1st agricultural product exported, 4th exported product (1.3%)	Has a minimal place in Guinea's exports (12 KT/year in 2020)
Regulatory Authority	The Cocoa Coffee Council (CCC) is the body entrusted by the Ivorian State with the regulation, stabilization and development of Côte d'Ivoire's coffee and cocoa sector. It is the result of the aggregation of the Coffee and Cocoa Exchange (BCC), the Cocoa Coffee Regulation and Control Fund (FRC), the Coffee-Cacao Producers	The Cocoa Board (COCOBOD) is responsible for facilitating, regulating, and developing cocoa production and trading in Ghana. It was created by executive order in 1947 from Ghana's share of the West African Produce Control Board. COCOBOD has many divisions, such as Seed Production Division, Quality Control Company	The only entities that directly regulate the market are the Government of Liberia and the Liberia Agriculture Commodity Regulatory Authority (LACRA) replacing the Liberia Produce Marketing Corporation (LPMC) in 2016. The Liberia National Cocoa and Coffee Export Association (LINACEA) also	The Ministry of Agriculture and Forests (MAF) is the body that mainly deals with the development of the cocoa sector. It collaborates with the Sierra Leone Investment & Export Promotion Agency (SLIEPA) on plant promotion, with the Produce Monitoring Board (PMB) on quality and certification and with other	The Federal Ministry of Agriculture and Rural Development (FMARD) is responsible for the cocoa sector. The Ministry of Trade and Investment is in charge of quality control of exported cocoa (Hütz-Adams et al., 2016).	Guinean Agency for the Promotion of Exports (AGUIPEX), with the adoption in 2020 of six standards governing the sector and its sustainability.

	Côte d'Ivoire	Ghana	Liberia	Sierra Leone	Nigeria	Guinea
	Development Fund (FDPCC) and the Cacao Coffee Regulatory Authority (ARCC),	Limited, which each have their role.	belongs to the landscape (grow, 2021)	ministries on certain themes (finance, market, etc.). (Conteh E., 2019) The goal is the creation of the National Cocoa Development Board (NCDB).		
Research organisations	The CNRA or National Centre for Agricultural Research of Côte d'Ivoire is in charge, among other things, of varietal research. For example, the CNRA has made available to cocoa farmers varieties with high yield potential (large pods with size beans meeting the official criteria), supposed to have good sensory qualities or	CRIG (Cocoa Research Institute of Ghana) is a division of COCOBOD. This entity has several axes of study, on the establishment and improvement of cocoa orchards but also on the issue of diseases and development of new products. This division is also responsible for mapping the sector in Ghana.	Central Agricultural Research Institute (CARI) is Liberia's agricultural research centre that appears to have stopped cocoa research during the civil war and has not resumed activities on these topics since.	Sierra Leone Agricultural Research Institute (SLARI) was established in 2007 as a semi-autonomous state agent. The main research line the government expects is an approach by the Agricultural Production Value Chain for commercial rather than subsistence agriculture.	The Nigerian Institute of Cocoa Research (CRIN) is developing cocoa species that are more resistant to disease and have high yield potential. The CRIN is also responsible for providing cocoa farmers with better quality plants.	IRAG, Agronomic Research Institute of Guinea

	Côte d'Ivoire	Ghana	Liberia	Sierra Leone	Nigeria	Guinea
	tolerance to CSSVD.					
Dissemination and supervision structures	The mission of ANADER is to contribute to the improvement of the rural world's living conditions through the professionalizatio n of farmers and professional agricultural organizations. In the cocoa sector, it publishes official guides, trains via its wide network of organizers while managing collections of cocoa clones with various properties (tolerance to mirides, CSSVD, brown rot, good yields, etc.)		Liberian National Cocoa Sector Public-Private Platform (NC3P)	The data concerning cocoa in Sierra Leone is little known at the moment, recovered marginally by NGOs during missions, but not yet complete, organized and centralized. The MAF, in collaboration with other bodies (SLARI, NCDB, StatSL), is responsible for carrying out this work according to the National Cocoa Value Chain Policy document.	The Central Bank's NIRSAL Division (Nigerian Risk Sharing System for Incentive-Based Agricultural Loans) guarantees loans to trading companies and cocoa farming groups. NIRSAL also provides technical assistance and assistance in the implementation of projects managed by donor organizations.	
Fixed Price (Y-N)	YES	YES	NO / Yes some years 20-21	NO	NO	NO

	Côte d'Ivoire	Ghana	Liberia	Sierra Leone	Nigeria	Guinea
			(LACRA)			
Possibility for export, direct purchase from planters (Y-N)	YES	NO (not for certified cocoa at least)	YES	YES	YES	YES

3 Issues in the cocoa sector

With a concentration of more than 70% of the world's brown gold production, West Africa's cocoa sector also faces many challenges. A *Hardman agribusiness* study identified very different dynamics between Africa, Latin America and Asia in terms of cocoa production and yield (Chen Y., 2016). According to the authors, African production increased with the area harvested, as yields tended to remain stable or even slightly decreasing. Thus, the structural increase in production may be directly related to encroachment on forests. This illustrates that field productivity in West Africa is slowly declining and that constant demand has pushed farmers to expand their farms. In addition, despite low prices, producers are tempted to expand their area to compensate for the price differential, referred to as the scissor effect, between cocoa and other goods and/or services (health, education, etc.).

Growth could therefore be achieved at the cost of significant social and environmental costs, as set out below. To maintain its position as a world leader, West Africa needs a profound structural change in its agricultural model (South America has a more respectful and growing production).

3.1 Decent income

The cocoa price has been hovering around US$2,400 per metric ton for five decades and despite chocolate price increases, producers are not earning more. In 1970, the cocoa bean accounted for 50% of the chocolate bar's value. Today, producers only receive 6% (The Guardian, 2022). The conventional sector, dominated by a few actors and increasingly financialized, is not sustainable because of purchases at low prices compared to local producers' economic needs. This entails societal costs in the countries that cultivate. Producers' income is far below subsistence level and even far from the decent income of this sector. For example, in Côte d'Ivoire in 2017, the median income of a producer household was USD 1,919/year while the minimum subsistence income for a typical household of 8 members in Côte d'Ivoire is estimated at USD 7,318/year (FAIRTRADE, 2018). The debate about lifting West African cocoa farmers out of poverty has been going on for years. The cocoa farmers' labour budget does not allow them to hire sufficient and qualified labour, or even to increase productivity (an operation that requires upstream investment).

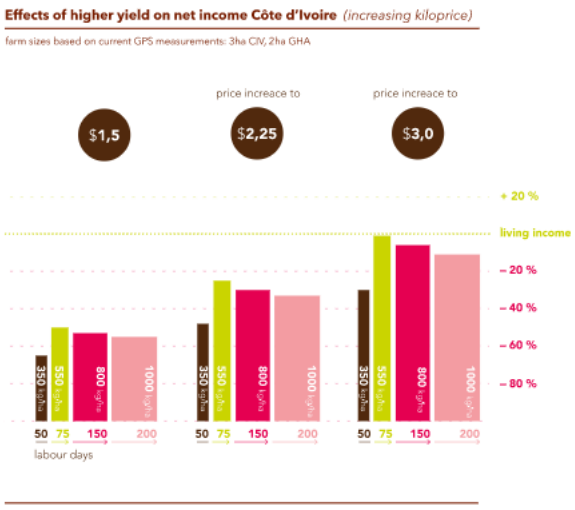


Figure 10: Profitability based on price per kg and productivity per ha; Source: Cacaobarometer, 2022

In addition, in response to the possibility of reducing cocoa farmers' poverty, most private enterprise projects focus on improved productivity. The latter does not provide a better net income to the producer. Indeed, high productivity implies a greater volume of work, which does not solve the problem of salary. For example, according to Hütz-Adams (2016), to cover only the costs of ten days of additional labour and inputs related to the search for productivity, it would take almost 100 kg of additional cocoa. There is no price guarantee, but the climate risks persist. It has been shown that increasing cocoa fields' productivity and surface area of could aggravate the social situation by placing the risk increasingly on the producer (HUTZ-ADAMS, 2022).

Understanding the definitions around child labour

Child labour does not pertain to all children on cocoa plots, nor all the tasks entrusted to them.

There is:

- light work: occasional spots that do not interfere with schooling or the opportunity to enjoy childhood
- child labour: work that interferes with schooling, the ability to enjoy their childhood and endangers their health or well-being

Worst Forms of Child Labour (WFCL): conditional or unconditional, have been ratified by all countries (ILO Convention 182) considering trafficking, slavery or forced labour

Thus, one of the best ways to properly increase producers' incomes is to increase the price per kg actually paid. According to the Cocoa Barometer, productivity influences producers' income marginally (and not only positively).

Productivity ≠ Decent income

Higher price per kilo => Better income to the producer

3.2 Human rights

The 2022 cocoa barometer draws up a long, non-exhaustive list of the human challenges of cocoa production areas that need to be managed properly in the context of sustainable production: gender inequality; child malnutrition; lack of access to education, sanitation and inadequate health structures, lack of reliability of the land system… There is a specific action plan for each challenge. Access to a living income is the key to resolving all these difficulties, although it is essential to note that the living income is a step towards improving living conditions and not an end goal.

Today, about 2 million children work in the cocoa sector (BASIC, 2016). While it is necessary to distinguish child labour, slavery and aid in the field, we must open our eyes and take drastic measures to stem this destruction of universal human rights. The ILO drafted Laws to safeguard children's rights; some links are available in the references on page 79.

An integrated system in the supply chain now makes it possible to identify children forced to work. Child Labour Monitoring and Remediation Systems (CLMRSs), when designed correctly, identify 60% of children who are forced to work and then lead almost half of these children to stop working after three years of monitoring. The CLMRS cost is negligible for the exporter; the Barometer estimates it at US$85/household or 6% of the producer price (which itself represents 6% of the final price).

Gender inequalities are strongly present in agriculture as well as in cocoa farming. Women are involved in the majority of tasks from the nursery to drying pods without obtaining the same access to services as men (e.g. consulting, certification or credits). Sustainability programmes in the cocoa sector must be designed with the gender dimension in mind; otherwise they risk increasing gender differences and failing to reach half of producers.

3.3 Environment and Biodiversity

Although deforestation is not due only to the expansion of agriculture, it remains the main cause. Agriculture and livestock account for 80% of global deforestation (soybean in Brazil, cocoa in Côte d'Ivoire, oil palm in Indonesia to name only the largest sectors).
This deforestation in favour of agriculture is the product of two distinct factors: the increase in global consumption (particularly with a growing global demography and a universalization of consumption patterns) and unsuitable farming methods (extensive monocultures for example).
The rest of deforestation is due to: increasingly common forest fires; pests; urban sprawl, also called artificialization of forests (roads, buildings, dams, etc.), which remains minimal; timber exploitation (which still constitutes 5% of global deforestation, especially tropical timber), mining and oil exploitation (directly and indirectly), and climate change impact (drought, floods, high winds, etc.) without forgetting issues of poor governance and economic factors. (SNDI, 2018; Conservation Nature, 2022)

Unfortunately, forest destruction involves undermining an ecosystem that has many positive actions: in addition to being a habitat for biodiversity and useful resources for Humankind, the forest is a barrier to climate change, constituting immense carbon sinks and protecting crops and populations from bad weather (floods avoided thanks to good soil drainage by plants, droughts more tolerable due to the shade of trees, barriers to dry winds, etc.). Deforestation therefore cancels all these "ecosystem services" and creates inhospitable spaces to grow cocoa properly.

Some of these forests are now classified as nature reserves and protected areas nationally and internationally, to preserve forest cover and endangered wildlife (hippopotamus, primates, forest elephant, crocodiles, etc.) while including the development of local populations' peripheral activities.
Despite these statutes, and therefore the prohibition of certain practices in these areas (such as agriculture, deforestation, hunting), deforestation continues to worsen (Mighty Earth, 2019).

Biodiversity

Biodiversity, by definition, is all the components and variations of the living world (plant, animal, fungi, bacteria…). There is ecological diversity (ecosystems), specific diversity (species) and genetic diversity (genes). Humans are dependent on this biodiversity directly (for their food needs) and indirectly (by the services that biodiversity offers such as the contribution to regulatory services for example).
The interaction between the agricultural holding and biodiversity takes place at several levels:

- Biodiversity of plot pollinators

Agroecology and biological control, including reintroduction of auxiliary insects, make it possible to no longer treat plots with chemicals. Thus, we go from very low diversity for a chemically treated field (15 species of insects on average/plot) to high diversity (more than 800 species). Of these 800 species, the majority are considered useful species (pollinator, pest control, decomposition of organic matter).

- Plant biodiversity of the plot

A genetic diversity of cocoa trees on the same plot allows greater resilience to pests and diseases and climate change effects. The association of species also makes it possible to extend the cocoa trees' production time (vegetation cover capturing nitrogen, agroforestry tree species, etc.).

The problem inherent in this deforestation is that it only provides space for farmers in return for soil depletion, which implies a decrease in productivity (directly impacting small producers), pressure on wildlife and local ecosystems (destruction of natural habitats) and a loss of resilience to climate change (losses of carbon sinks that these forests represent). The vicious cycle of deforestation to allow cocoa farmers to provide for their needs must be interrupted before the forest totally disappears. (World Bank, 2018).

Pesticide use and other inputs is an effective way to combat the many cocoa tree diseases. However, although some States, such as Ghana, try to promote the rational use of these pesticides (common active ingredients: metalaxyl, cuprous oxide, cuprous hydroxide, bifenthrin, thiamethoxam, etc.), this results in greater damage than before their use: soil acidification, toxicity of products widespread in the environment, water contamination, etc.). Other pest and disease management practices are certainly more environmentally friendly but more expensive, with less predictable results, and more complicated to implement than pesticide use… (InTech, 2011)
Another problem concerning the use of plant protection products in Côte d'Ivoire (and probably in other countries), glyphosate (a highly aggressive product for vegetation and probably carcinogenic according to the WHO) is used without protection by producers and their children to reduce the time required to weed in the field).

- Plant Biodiversity of Adjacent Forests

Tropical rainforests are often very dense, with an average of 100 to 300 different species only of trees per hectare. It is estimated that the world's tropical forests shelter 60% of the world's species and varieties, thus justifying the need for their protection. Conservation of forest areas is an opportunity: if the deforested plot is kept in regeneration, protected for 20 to 30 years, it will regain the majority of its biodiversity and also its functionality (CO_2 capture, restoration of soil fertility and water reserves) (CIRAD, 2022b).

- Animal Biodiversity of Adjacent Forests

The plots, encroaching more and more on the forest estates, enlarge the exchange zone between man and wildlife. There are two major risks: (i) the increase in poaching leading to the decline of animal populations and (ii) the increase in infectious diseases and pandemics (zoonoses).

Due to low incomes and the lack of means to invest in the maintenance of productive cocoa (renewal, varietal selections…), farmers unfortunately have few alternatives. This is how vicious circles of social and environmental destruction are created for an increase in brown gold production, illustrated in the 2016 BASIC study (Figure 11). The key to sustainable cocoa is therefore access to a fair, remunerative and stable price.

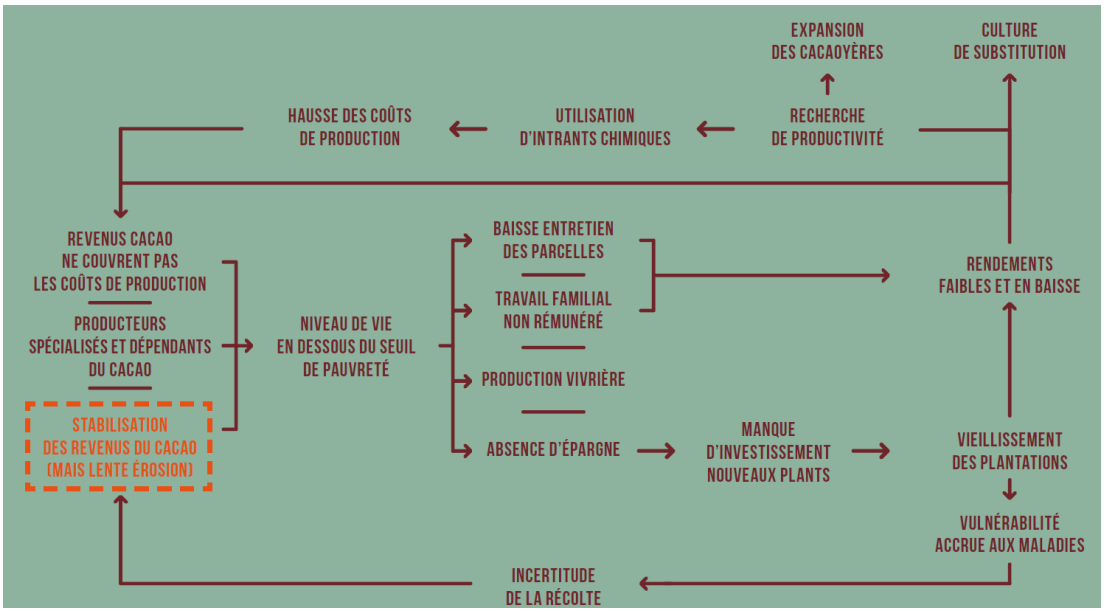


Figure 11: Cocoa crop impact loops in West Africa; source: BASIC, 2016

Despite this context, what can keep farmers in the sector? Cocoa is an important crop for farming communities around the world as it represents a significant income source. While cocoa prices may vary from year to year, global demand for chocolate and other cocoa products remains strong, prompting many farmers to continue the crop with assured market opportunities.

In addition, in many countries, cocoa has been a traditional crop and a key part of the local economy for generations. Farmers often invest time, money and resources in cocoa cultivation and developed expertise in its cultivation and post-harvest processing. For many farmers, abandoning this crop would mean abandoning their income source, a way of life and trees usually planted by the previous generation. Furthermore, since cocoa is grown mostly in Africa in rural, remote and disconnected areas, a global vision of the sector remains inaccessible to the farmer, which delays awareness.

The profitability of cocoa cultivation often depends on factors such as labour cost, market prices, agricultural practices used, and weather conditions. Farmers can therefore continue to grow cocoa even if it is not profitable at some point, hoping that conditions will improve in the future.

Finally, some farmers may be incentivized to continue growing cocoa because of agricultural development programs that offer financial incentives and guidance to improve crop productivity and profitability.

According to LE BASIC's study, this negative loop can be completely broken, taking the example of some Peruvian cooperatives that have entered a virtuous circle:

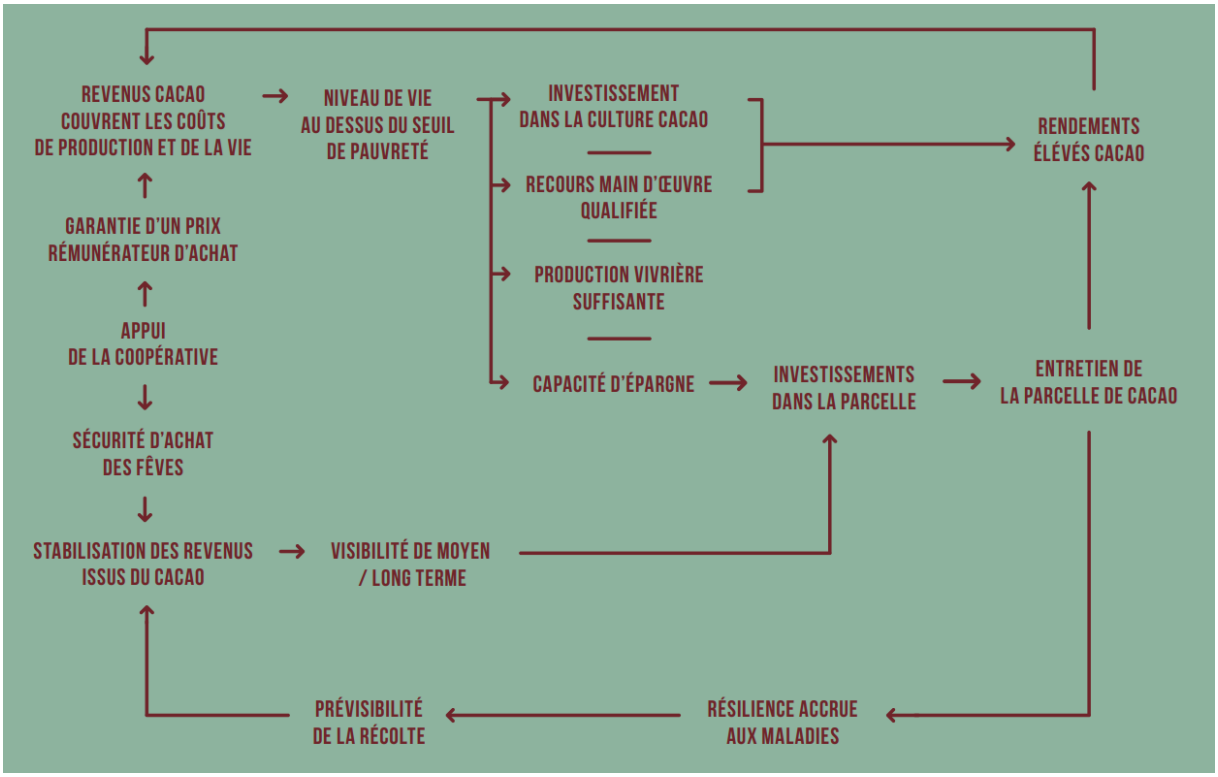


Figure 12: Pathways and impact loops in certified cooperatives in Peru (Le Basic, 2016)

4 Current practices and their limitations

4.1 Cocoa ecology

In the natural state, the cocoa tree is present in the intertropical rainforest (especially in South and Central America). The tree needs heat (from 23 to 28 °C) and requires high humidity (1,500 to 2,000 mm of precipitation per year) to be able to grow, and dry seasons must last fewer than three months. Because of its sensitivity to water stress and strong winds, planting is easier under a canopy that will maintain humidity, freshness, and, depending on the species associated, fertility, by transferring nutrients from the deep layers of the soil to the surface or by the fixation of nitrogen by certain species. The cocoa tree comes into production from about 4 years (growth phase requiring particularly shade) and experiences a production plateau between 8-12 years and 20 years; its production declines from 25-30 years. In its natural state, it rises high and provides very few pods. Mainly insects pollinate this plant.

The main cocoa groups

According to the Cheesman classification (1944), three main variety groups are cultivated (CHARVET, 2012):

- Criollo: fine and aromatic cocoa, sensitive to diseases, so generally little used. It is particularly sought after as specialty cocoa (low volumes of superior quality)
- Forastero: 80% of the current world production is the easiest to grow because it is robust and resistant to diseases; its potential yield is higher.
- Trinitario: hybrid variety of the first two, 10-15% of current world production

Diseases and Pests

The cocoa tree is prone to many pests and diseases depending on the growing environment and the technical route used. These cause between 30 and 40% of production loss globally.

Different species of pests affect the tree's development and production phase.
Nurseries and young cocoa trees are exposed to the most pests, which cause the most damage. Caterpillars delay development by destroying terminal buds; psyllids attack terminal buds and tender twigs; bark beetles bore tunnels in the stem, which greatly weakens the cocoa tree in its growth and productive state, and termites attack the base of young trees.
The adult cocoa tree is rather prey to mirids (4 different species), the number one scourge of cocoa trees, as well as green bugs and stem borers, which, without treatment, can cause serious plot losses. Damage by these insects results from drying out certain plant sections and can even lead to the plant's death in the event of a major attack.
These pests are the most common in West Africa, but there are still others: leafhoppers, sesiidae, especially in South America… In addition to insects, rodents (squirrels and rats in particular) consume ripe pods and destroy part of the crops.

Two main phytopathogens spread within cocoa trees in West Africa:

- The first is swollen shoot virus disease (CSSV). This viral disease, characterized by swelling of certain plant sections (stem, dry twigs, roots) as well as deformities of pods and beans, can kill a cocoa tree in 3 years. Biting-sucking insects such as mealybugs in particular are responsible for transmission.
- The second, which can be treated more easily, is brown rot, due to a fungus attack (genus *Phytophtora*). It can cause up to 50% loss of production without intervention. The infected

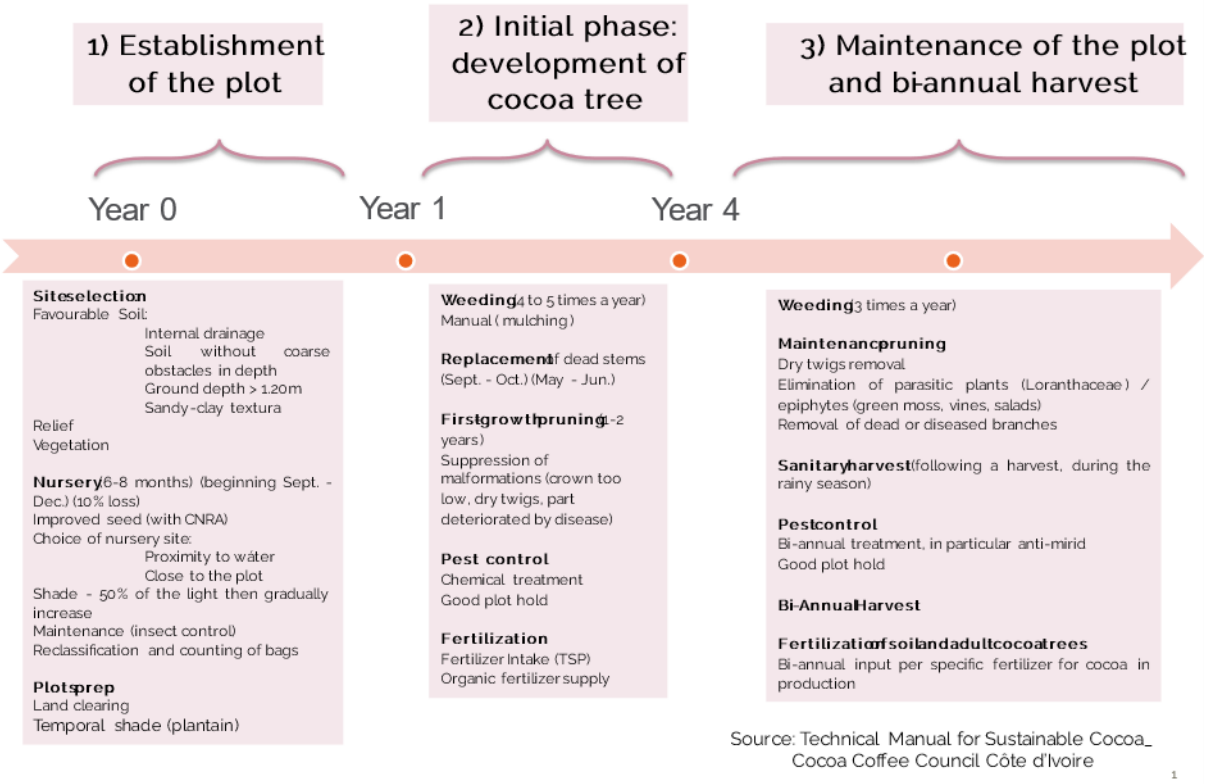
pods are covered with brown stains and the beans are no longer marketable. This disease, although global, affects more particularly Africa (Central Africa in particular, then spread to the West) because of a species of virulent fungus. The origin being fungi, moisture and dried pods increase the chances of spreading this disease.

Good plot maintenance avoids creating spaces for proliferation of phytopathogens. This includes sanitary harvesting of rotten pods or uprooting plants contaminated by the Swollen Shoot.

4.2 Focus on West Africa's cocoa farming practices

Cultivation techniques recommended by the technical services

The technical services of each producing country have official cocoa farming guides and manuals. However, their implementation by producer organisations depends on their means (and therefore on members' ability to save, to invest) and on supervision by technical services or NGOs.



Source: Technical Manual for Sustainable Cocoa_ Cocoa Coffee Council Côte d'Ivoire

Figure 13: Recommended cocoa technical route in West Africa

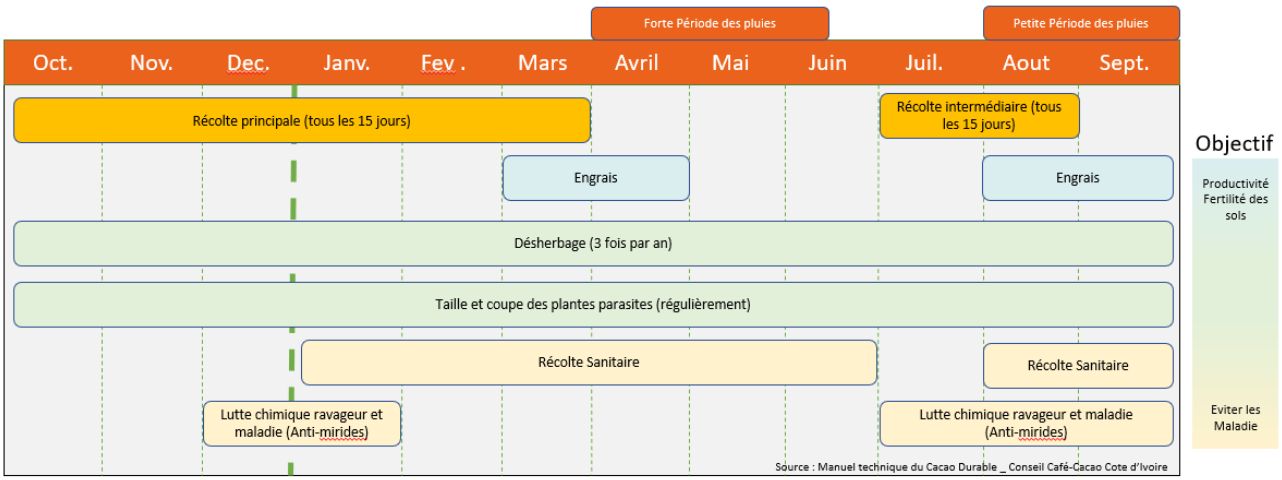


Figure 14: Annual Synthetic Agricultural Calendar for Cocoa in West Africa

To produce more pods (and therefore beans), full sun is a short-term ally. Thus, farmers install cocoa trees under cover (in forests classified fertile and available) and continue cultivation by felling large peaks to allow light to penetrate the cocoa trees (felling large trees).
In the literature, it is also prescribed to prune cocoa trees in agroforestry, allowing a gain in productivity per hectare by the proper use of nutrients and solar energy (increase from 430 to 710 kg/ha on average) (ESCHE ET AL. ,2021).
Cultivation practices play an essential role both in terms of productivity and in field sustainability. Many cultural patterns and practices coexist on a global scale. They can be classified into three categories: monoculture, mixed and agroforestry system. While monoculture dominates in Côte d'Ivoire or Ghana, in South America, agroforestry systems (complex or not) are predominant (SANIAL, 2019).

Current major practices in West Africa and their consequences

This section presents the limitations of current practices. Section 5.6 will then detail good agronomic practices to maintain a good compromise between shade rates, cocoa productivity and pest and disease management.

The dominant practice in West Africa is cultivation of cocoa in full sun or under very light shade. Farmers in need want to maximize short-term yields. Over the years, the fields become less productive through degradation of soils, ecosystems and trees. They are then abandoned in favour of new forest spaces (ANGORAN, 2018; RUF, 1995; TONDOH et AL. 2015).
The large proportion of ageing cocoa fields explains West Africa's decline in yields observed, while the spread of the cocoa swollen shoot virus (CSSVD) is leading to reduced production capacity in other affected regions. The cocoa area of Côte d'Ivoire and Ghana is composed of a multitude of fields of different age classes, including non-renewable trees with decreasing yields. Productivity of CSSVD infested plots decreases rapidly and the field dies within a few years. Farmers often cannot escape the vicious circle of low productivity and low income, leading to a lack of investment in their farms (no renewal, diseased cocoa trees…) and persistence of low yields (HERNANDEZ ET AL., 2014; HÜTZ-ADAMS ET AL., 2016).

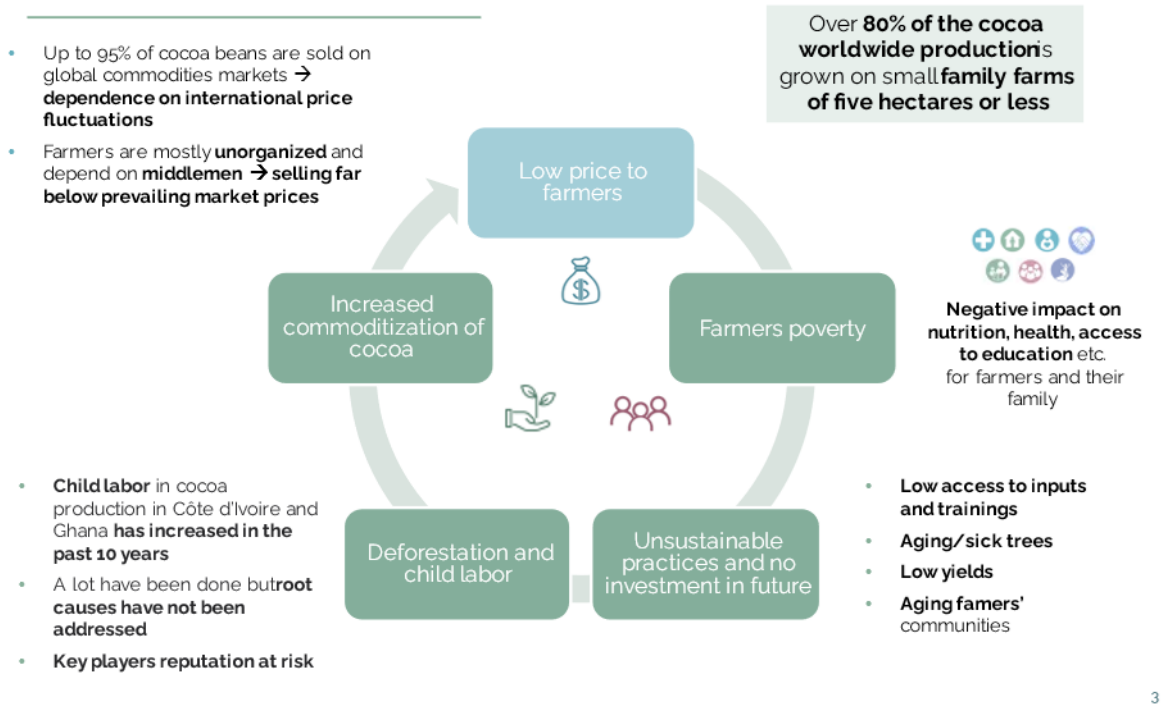


Figure 15: The vicious cycle of unsustainable cocoa (source: Kinomé and FCPF, 2022)

Orchard depletion and therefore the decrease in yield or production on a regional scale consequently results in a shift of cocoa plantations to new areas. Generally, creating new fields causes deforestation (RUF, 1995; GOCKOWSKI and SONWA, 2011; AMIEL, 2019b).

Faced with increasing deforestation in West Africa as well as the impoverishment of land and people, states have formulated laws and official recommendations, research institutions and NGOs have conducted many guides and training courses, and private companies have used internal or external standards (see Sustainable cocoa).

Choice of crop biodiversity

Family farming in West Africa is extremely diverse. In the early years of cocoa farming, each household grows cereals, legumes, condiments, and plantains for self-consumption.
Soil types and functionalities are very diverse, even sometimes within a single farm. Farmers adapt their production to their soil and thus cultivate a diversity of species and varieties. This diversity allows being more adapted to the terrain's specificities but also more resilient because of an assurance effect: the more the ecosystem is diversified, the more stable the biomass production will be over time, even during major climate changes or disease. Thus, seed distribution is useful to farmers but should not be exclusive: farmers can then obtain seeds and plant materials from other farmers, on different plots or in the markets (CIRAD, 2022b).

Varietal selection and seed availability

In the mid-1970s, the "Ghana" variety belonging to the Forastero group was introduced to Côte d'Ivoire for its high production capacity in full sun. It gradually replaced the Amelonado cocoa already present. "Mercedes," a hybrid variety the CNRA developed, withstands a relatively low shade and has promised to produce up to 3t/ha during seed distribution since the beginning of the 21st century. These different selections have encouraged techniques called full sun and therefore also favoured cutting shade trees in plots (HEYMANS, 2020; IWARO, A. D. ET AL., 2006).

Today, the plant material present in Liberia and Sierra Leone is believed to have come from Ghana's varietal selection with low genetic variability (from five different parents). What is called "French cocoa" in the sub-region represents cocoa from the IRCC research of the 1980s. The IITA develops hybrids that are mostly adopted by farmers through encouragement of private companies with the financial resources to (i) buy the seed, (ii) train farmers in GAPs and (iii) renovate non-productive plots.
Overall, "Mercedes," "Ghana," "Tetteh Quarshie," "French" cocoa are not stable over time and have a high variability over the years of production. Cocoa called "Tetteh Quarshie" seems to be the most represented in West Africa (notably Liberia, Sierra Leone, Guinea, Ghana, Nigeria).

One of the major recommendations by the experts consulted is to promote the dissemination of self-compatible seeds (and not subject to cross-fertilization) to facilitate the installation and renewal of plots and, when possible, promote mixing varieties to minimize the risks related to pathogens and resource needs (water, sun, fertilizers...) (KOFITUO, 2022; BASTIDE, 2022). Public-private partnerships are also considered key to the future because research is a tool to meet agronomic needs and companies have the opportunity to invest in improving agricultural practices, for example, through dissemination of varieties from research within their networks of affiliated producers.

Whether in terms of productivity, resistance to diseases and pests or resistance to climate change effects, experts recommend redoubling efforts on agronomic methods (shade, amendments, appropriate size…) because these are those that have a short, medium and long-term impact. As an example, from the fifth year after planting, it is possible to rectify non-productive species by grafting them with material from a productive tree of the plot (identified by the producers).

Social and societal constraints on cocoa production in West Africa

Cocoa farmers face a triple challenge: increasing their productivity over a smaller area, reducing pressure on forests and ecosystems while improving their resilience to climate change. The social challenge is major because it concerns a large number of West African inhabitants. For example, in Ghana alone, more than 800,000 households derive their income directly from cocoa production (MALKA ET AL., 2022).

The study conducted in Côte d'Ivoire among 295 farmers to assess the reasons for the mortality of the majority of shade trees planted in cocoa crops shows that farmers recognize shade trees' multiple benefits and are ready to devote immediate time to planting and maintaining them. Two challenges have been identified for planting shade trees: (i) lack of direct funding for actions (ii) lack of technical support to address the disadvantages of agroforestry (WINDLIN ET AL., 2021). Also, in a study conducted in Ghana, lack of funding is presented as the first obstacle to adoption of an agroforestry system (including through labour financing) and also (i) the poor distribution system of forest equipment (ii) lack of consideration of Indigenous knowledge for the implementation of projects and (iii) non-existence of the weather forecast system essential to plantations (MALKA ET AL., 2022).

Despite an awareness of the need to adapt to climate change (including droughts and pests), the majority of farmers see agroforestry as an opportunity for income diversification and not as a system to promote cocoa production (KINOME, 2022).

Producers first perceive Agroforestry as a diversification of income and not only a system promoting cocoa production

4.3 Climate change challenges

As explained above, the cocoa tree needs relatively specific climatic conditions to produce. As climate change effects intensify, cocoa cultivation could become increasingly complex. One of climate change's first impacts is rising temperatures. In addition, rainy seasons are likely to be shorter or less intense. The climatic hazards will also be stronger (drought, drying wind, flooding).

Rising temperatures lead to (WCF, 2018):

- Increased mortality of plants, berries and flowers;
- Smaller beans;
- Decreased effectiveness of pesticides.

Variation in precipitation can result in:

- Increase in viruses and diseases (brown rot and fungal diseases);
- Increase in losses of flowers and pods;
- Increased soil erosion and mineral leaching;
- The growth of bushfires endangering fields, biodiversity and human habitation.

In a recent study, CGIAR published the map below (Figure 16), outlining the potential reduction in areas suitable for cocoa farming in West and Central Africa. The knowledge of such scenarios makes it possible to anticipate (i) the risk of displacement of production fronts to forest areas less impacted by the effects of warming (ii) the imminent need to adapt current production practices to make them sustainable and (iii) reduce their impact on climate change.

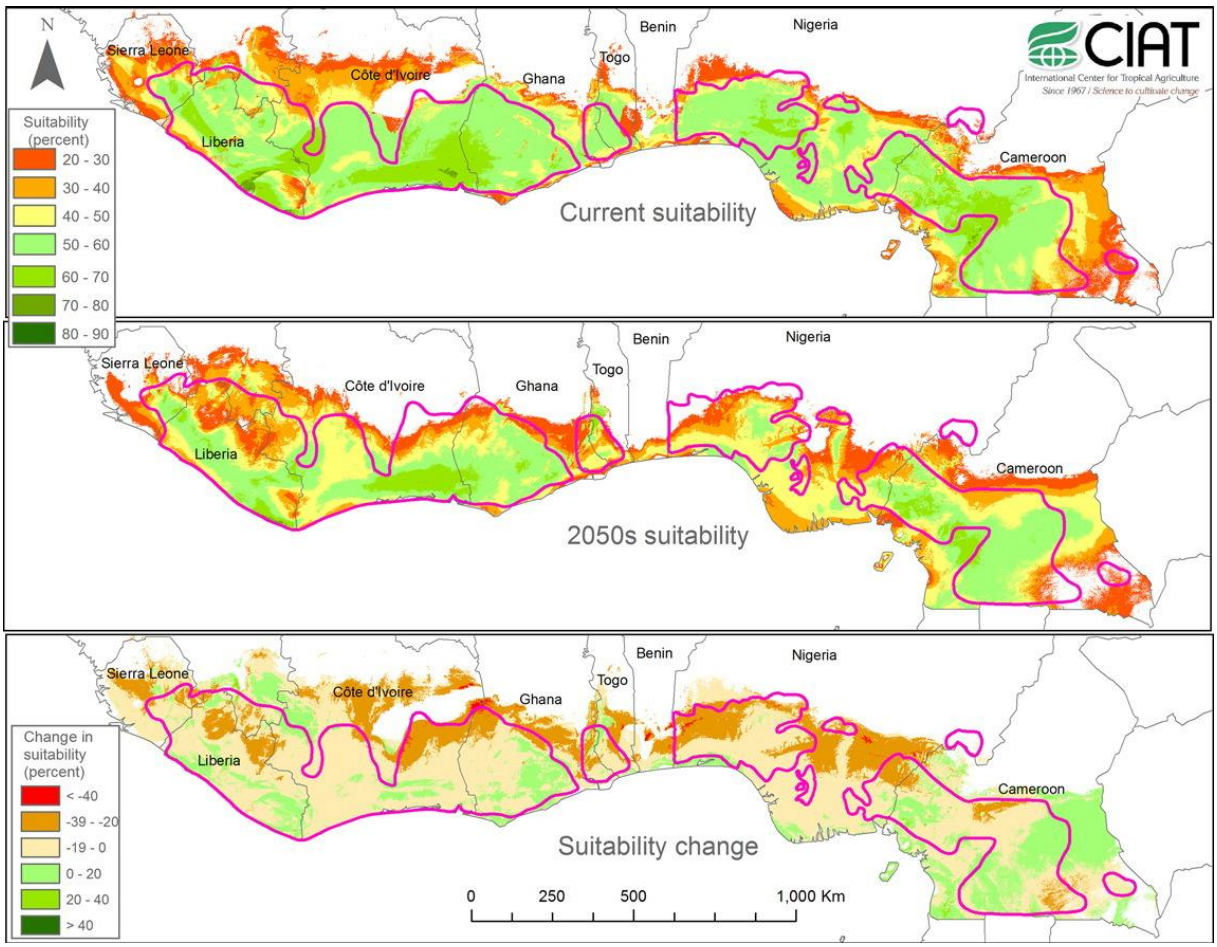


Figure 16: Vulnerability of the cocoa sector to climate change; Source: SCHROT ET AL., 2016

In this context, cocoa agroforestry is considered one of the existing adaptation options, especially for those who cannot afford to invest in irrigation. More generally, it is even possible to speak of a compromise between cocoa production, shade rates and ecosystem services. In their attempt to quantify possible trade-offs in cocoa agroforests, Blaser et al (2018), analyzed the impact of different shade levels on agricultural production, climate adaptation, climate mitigation, and biodiversity conservation. They argue that different levels of costs and benefits are achieved across the shade gradient, with improved cocoa yield at lower shade levels and high biodiversity gains at higher shade levels (Figure 17).

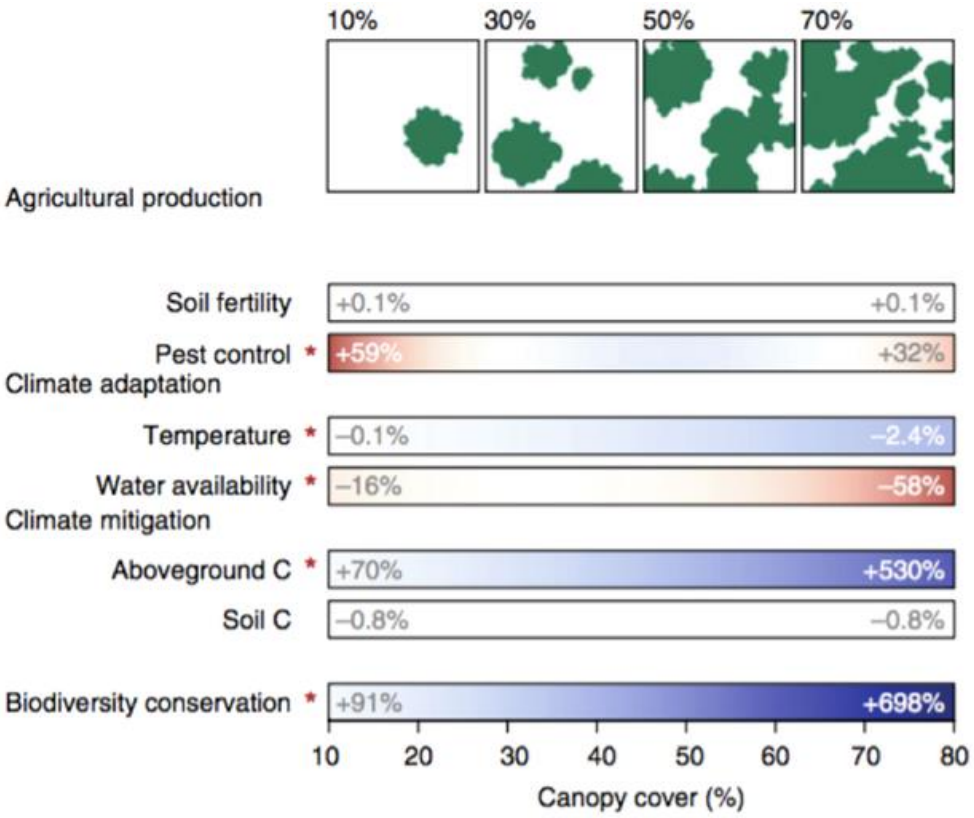


Figure 17: Agricultural production, adaptation and mitigation of climate change the effects and conservation of agroforestry biodiversity compared to those offered by cocoa quasi-monoculture according to different shade levels (10-80%).

In Ghana, COCOBOD and research have already developed an adaptation strategy based on agroecological zoning.

Box 1: A case for the different climate impact zones of Ghana (Kofituo K. R. and Asare R., in World Bank 2022)[3]

The Ghanaian cocoa landscape is currently divided into three areas of climate change impact on cocoa production capacity: the transform zone (the capacity of cocoa production in this area is expected to be highly unpredictable), the adjust zone (capacity requires systemic adaptation to ensure productivity at current levels) and the "cope zone" (capacity is relatively stable or relatively favourable to cocoa production compared to other areas). The 'transform zone' dominates Ghana's deciduous and semi-deciduous ecological zones; the 'adjust zone' dominates Ghana's evergreen wetland ecological zone, as does the 'cope zone.' The economic impact on farmers without adaptation strategy is expected to 60%-100% reduction in cocoa revenues in the "transform zone," 30%-50% reduction in cocoa revenues in the "adjust zone" and 10%-20% reduction in cocoa revenues

[3] This text is based on a contribution from two IITA cocoa and forestry experts who participated in the South-South Knowledge Exchange programme organized by the World Bank/ FCPF.

in the “cope zone.” The difference in the climate change impact on the various ecological areas of Ghana can be reduced depending on the cocoa agroforestry model practised. The intensity of the climate change impact informs the extent of the necessary shade recommendation. The following interventions are proposed for the different climate/ecological impact zones so that cocoa agroforestry can progress; 1) Adaptation zone: 15-25 trees/ha which will provide 30-40% shade coverage. 2) Adjust zone: 20-45 trees/ha which will provide 40-50% shade coverage. 3) Transform zone: 25-50 trees/ha which will provide 50-70% shade coverage, considering the diversity of shade species in the different climate impact zones in Ghana.

5 Sustainable cocoa

5.1 Definition of sustainable cocoa

ISO 34101-3 defines sustainably produced cocoa as "cocoa beans produced in an **economically viable**, **socially responsible** and **environmentally sound** manner within an organism." According to the ARS 1000, sustainable cocoa is cocoa, including economic, social and environmental aspects, which meets the present needs without compromising the ability of future generations to meet their own.

5.2 Laws governing sustainable cocoa and associated obligations

The legislative framework also makes it possible to regulate cocoa production. It is either internal to the country (law enacting the prohibition of child labour, orders regulating producer prices, compliance to allow certification, etc.) or external to the country (EU regulation to avoid imported deforestation, US law on child labour, etc.), and does not necessarily target the same actors.

National laws and programmes

In Côte d'Ivoire

- **PPREF:** Forest Preservation, Rehabilitation and Extension Policy, adopted in 2018 followed by a new Forest Code (2019 edition). The classification of forests by category suggests different actions according to their degradation rate and imposes a transition rehabilitation through agroforestry between two categories, always with the aim of stopping cultivation in forests. Agroforestry has an official status in these texts.
- **NDC:** Nationally defined contribution: This does not specifically mention deforestation related to cocoa but mentions agroforestry for development of agriculture without expansion into existing forest land.
- **PINA:** National Investment Plan for Agriculture (including REDD+ actions): reduce deforestation from cocoa cultivation by at least 80% by 2030 (a reduction of 44,000 ha/year). The country also plans to implement payments for ecosystem services (PES) at the national level to support the implementation of agroforestry
- **Forest Investment Programme (FIP):** the objective is to conserve and increase the forest stock and improve access to sustainable forest management revenue sources for selected communities in the target areas.

Ghana

- **NDC** aims to reduce GHG emissions from cocoa by 45%
- **GCFRP:** Ghana REDD Cocoa Forest Programme: Cocoa is at the heart of the country's REDD+ strategy. The programme aims to improve yields through environmentally sound and smart agricultural practices, promotion of agroforestry and forest restoration, support for small-scale producers and restoration of natural resources.
- **Forest Investment Programme (FIP):** The objective is to address the drivers of deforestation by focusing on improving forest management practices. Among the 3 projects of the Ghana programme, the first aims to strengthen agroforestry (and has most of the funds), and the other two aim to secure the participation of local communities and then the private sector in REDD+.

International Laws

As an example, Europe is the world's largest consumer of cocoa products with a thriving industry (62 billion euros in turnover/year) and consumption of up to 10kg/year/capita (CIRAD,2022). Europeans are now responsible for 10% of global deforestation through the import of agricultural and forest products (Conversation, 2022). France, the seventh largest importer of cocoa in the world, has also signed up to a National Strategy Against Imported Deforestation (SNDI) committing the country to be particularly vigilant about the traceability and ecological cost of soybean, palm oil and cocoa. The law defines imported deforestation as "the import of raw materials or processed products, production of which has contributed, directly or indirectly, to deforestation, forest degradation or the conversion of natural ecosystems outside the national territory." With objective 13, the SNDI aims to raise the requirement level of certifications, which must be improved in particular in considering deforestation in their indicators. The SNDI is part of the application of the European Union's new regulation.

5.3 New EU regulation to combat imported deforestation

On 6 December 2022, a provisional political agreement was reached between the European Parliament and the Council on an EU Regulation on zero deforestation supply chains.
This regulation aims to prevent the import of agricultural and forest products responsible for deforestation and forest degradation on a global scale and thus to reduce greenhouse gas emissions and biodiversity loss. The EU is one of the largest importers of products such as soybean, palm oil, cocoa and timber, which can come from illegally deforested areas. The ZDI Regulation aims to ensure that these products are produced in a sustainable and environmentally responsible manner.

Once adopted and enforced, the new legislation will ensure that certain essential goods placed on the EU market will no longer contribute to deforestation and forest degradation in the EU or anywhere else in the world.
When the new rules come into force, all companies concerned must exercise strict vigilance if they place on the EU market or export from the EU various agricultural products including cocoa, as well as its derivatives.
The political agreement comes just 12 months after the Commission's 2021 proposal. The final version builds on the key features the Commission proposed, namely: combating deforestation, whether legal or illegal; stringent traceability requirements linking commodities to the agricultural land where they were produced; country benchmarking system.
The new regulation lays down strict due diligence rules for companies wishing to place the products concerned on the EU market or export them. Operators and traders must prove that the products are both "zero deforestation" (products on land that has not been deforested after 31 December 2020) and legal (comply with all applicable laws in force in the country of production). Companies will also be required to collect precise geographical information on the agricultural land where the products they supply were grown, so that they can verify these products' compliance.
Member States must ensure that non-compliance with the rules leads to effective and dissuasive penalties.
The list of commodities covered will be regularly reviewed and updated, considering new data such as the evolution of deforestation profiles. The Commission will implement a benchmarking system that will assess countries or parts of countries and their level of risk of deforestation and forest degradation (high, standard or low risk) also considering the agricultural expansion related to the production of the seven commodities and derivatives. Corporate bonds will depend on risk.
This system will also help guide EU cooperation with partner countries to halt deforestation, while paying particular attention to the situation of local communities and Indigenous peoples.
Internationally, the EU will strengthen its engagement, both bilaterally with producing and consuming countries and in relevant multilateral areas, to ensure effective implementation of the

new legislation and to assist producing countries as appropriate. The new rules will not only reduce greenhouse gas emissions and biodiversity loss, but also ensure the livelihoods of millions of people, including Indigenous peoples and local communities around the world who rely heavily on forest ecosystems.

The European Parliament and the Council have 24 months from December 2022 to formally adopt the new regulation. Once the regulation is in force, operators and traders will have 18 months to implement the new rules. Micro and small enterprises will benefit from a longer adaptation period, as well as other specific provisions

5.4 Existing standards and labels

Standards and initiatives

ISO Standard 34101-3

The cocoa sector's peculiar character is that it now has an international ISO standard for sustainable and traceable cocoa, the first of its kind for agricultural products. This standard covers the organizational, economic, social and environmental aspects of cocoa cultivation, includes strict traceability requirements, and provides greater clarity on sector sustainability. The effort required in terms of improving traceability is established with the aim of contributing to accountability in the global supply chain. Only cocoa produced according to this standard can be called "sustainable cocoa." This standard allows the physical segregation of batches during the various stages (including transport and storage) with a margin of manoeuvre of 10% tolerated and administrative traceability (mass balance system).

ARS 1000 standard

This ISO standard is debated in West Africa where a first regional standard was created; the main guidelines are:

- Use of high quality seeds
- Sustainable cropping practices
- Limiting pesticide use
- Respect for workers' rights
- Product traceability from field to export
- Independent certification to ensure compliance with the standard

This is the most important standard in West Africa. A more exhaustive summary is offered in the Appendix.

BIO-Trade Initiative

The BIO TRADE programme aims to promote sustainable trade in organic products between developing countries and the EU. This includes supporting organic producers and exporters by providing technical and financial advice to improve their products' quality and competitiveness in global markets. BIO-TRADE's analysis brings together knowledge of law and political science, evaluating rules, norms and debate. The programme is currently focused on Latin America and Asia (BIOTRADE, 2022).

National initiatives

In 2021, France joined the European movement, ISCO (Initiatives for sustainable cocoa), to create national initiatives to engage states, industry, traders, distributors, civil society organisations and research organisations. ISCO aims to create spaces for exchanges and collaboration to find sustainable solutions for cocoa farming in the producing regions. Today, there are the French Initiative for Sustainable Cocoa, Beyond chocolate (Belgium), Gisco (Germany), Swissco (Switzerland) and Disco (Netherlands).

Labels

Since the 1990s, voluntary sustainability standards aim to increase the yield per hectare and plot sustainability (environmental and economic). The main sustainability labels used in the cocoa sector are the Rainforest Alliance (resulting from the UTZ-Rainforest Alliance merger), the Fairtrade label and the Organic/Biologique label. They are differentiated by their criteria of environmental performance, traceability and remuneration to producers

Fair Trade

The labels certify that producers receive fair remuneration for their work, as well as funding for community projects. A pioneer and key player in the construction of sustainable agri-food, including in the world of chocolate, fair trade and its floor price remain subject to market fluctuations characterized by cocoa overproduction (even when equitable). The Fairtrade label requires responsible land management, including protecting forests, preserving biodiversity and limiting deforestation. There are several Fair Trade labels for cocoa: FT International (Max Havelaar), World FT Organization, Fair for Life, SPP (Farmers Symbol), Biopartenaire (Bio and FT), etc. An AFD and FFEM program, implemented by Commerce Equitable France and the NGO AVSF, has chosen to focus on promotion of fair trade in six West African countries, including cocoa producers such as Côte d'Ivoire, Ghana, Togo. This programme, called Equity (https://programme-equite.org/) has conducted numerous technical and economic studies as well as pilot initiatives to test agroecological and sustainable practices.

Rainforest Alliance / UTZ Certification

The certification focuses on sustainable forest management, sustainable agriculture and a better quality of life for workers and local communities. The label is committed to protecting forests by limiting deforestation and promoting sustainable land management. Eligibility criteria include protecting biodiversity, sustainable forest management and restricting the use of environmentally harmful pesticides. In Côte d'Ivoire, Rainforest Alliance certified beans accounted for 10% in 2016 (BASIC, 2016). It is also the label with the most demanding criteria in terms of combating deforestation and ecosystem conservation.

In general, here are some similar measures between the FT and RA label:
- Prohibition of illegal deforestation;
- Compliance with national and international laws and regulations for biodiversity conservation;
- Promotion of agroforestry and crop rotation;
- Protection of endangered species;
- Promotion of responsible forest management to preserve ecosystem services.

Organic / Biologique

For the cocoa parcel, the Organic certification makes it possible to impose standards that respect the environment of biodiversity. However, current standards (EU, US) do not fully consider the territory's environment and history. The eligibility criteria for the "Organic" label do not specify any restrictions on deforestation. However, they require sustainable natural resource use and preservation of biodiversity. There are several organic labels (European, American, Japanese, etc.)
In addition, certified ORGANIC raw materials depend on demand and supply; unfortunately, the price tends to decrease due to the small increase in demand and a clear increase in production (IDDRI, 2019)

	Critères environnementaux						Critères sociaux		Application de la certification		
	Définition de la forêt et seuils de défores-	Dégradation forestière	Pas de plantation sur tourbière	HCS	HCV	Respect des statuts légaux et/ ou coutu-	CLIP	Droit du travail et règles OIT	Tracabilité	Audit indé-pendant	Accès des petits produc-teurs à la certif
RA 2020 (agri durable)											
Fair trade 2019											
ISO 34101											

Figure 18: Summary of cocoa standard performance. Source: CST Forest 2022

These certifications are not mutually exclusive and the same farm can be certified under several labels to maximize its chances in the international market. However, obtaining certification is first restricted by farms' budgetary availability and prioritizing expenditure at the individual level. Today, the labels mentioned above seem to contribute to an improvement in the impact of cocoa farming on the environment without having a strong enough framework to stop destruction of forests.

5.5 Dynamics of cocoa certification

According to the CST report, the main standards (UTZ, Rainforest Alliance, Organic Agriculture, Fairtrade) certified between 26.8% and 44.2% of the global cocoa area in 2018:

- Just over a quarter of the world's cocoa area harvested was UTZ certified in 2018, representing an estimated 1.6 million tonnes of UTZ certified cocoa production harvested from more than 3 million hectares of cocoa trees;
- 10% were Fairtrade certified, for 536,556 tons of cocoa;
- 6.1% were Rainforest Alliance certified, for 404,253 tons;
- 2.7% according to different organic farming standards.

However, certified production is not necessarily sold as such and is not always associated with the guaranteed premium or minimum price.

5.6 Review of agronomic practices associated with sustainability

This section indicates that sustainability practices must be reasoned holistically considering the landscape within which cocoa farming takes place. From this viewpoint, two practices are particularly relevant:

- Agroecology places cocoa cultivation in the ecosystem in which it develops. The principles of agroecology consider the interactions between the different ecosystem components, such as soils, water, plants, animals and microorganisms. This approach optimizes natural resources and minimizes negative impacts on the environment. Thus, several major components of agroecology are involved in cocoa farming: rational natural resource use, crop diversification, respectful farming practices and the family farm's general economy.
- Agroforestry; part of agroecological practices and at the heart of many sustainable cocoa approaches, it is detailed as a practice in its own right.

5.6.1 Agroecological practices

Sustainable natural resource use

Agroecology promotes sustainable and rational use of natural resources such as water, nutrients and biological resources. For example, reusing rainwater for irrigation can reduce dependence on surface water sources, while using compost and manure to fertilize soils can increase nutrient availability and reduce chemical fertilizer use.

The WCF 2018 manual proposes several techniques:

- Permanent soil cover: With the combination of crops that limit soil erosion, keep moisture and provide nutrients to the soil (*Gliricidia* spp., groundnut *Arachis hypogea*, cowpea *Vigna unguiculata*)
- Mulching and adding compost: adding natural fertilizers, limiting weeding and maintaining humidity
- Drainage systems: construction of trenches to control excess water (which leaches minerals)

Diverse cultivation

Other crops such as fruit trees, vegetables and food crops can supplement the cocoa crop, which is essential to making a plot sustainable. This (i) minimizes climate change impacts by cultivating species that react differently to climate differences (ii) diversifies the producer's sources of income (cash crops, food crops, timber, etc.) and (iii) limits changes by protecting the plot more (shade trees or legumes).

For example, WCF offers the association with high value-added species such as pepper as well as some shade species to be integrated within or around the plot:

- Allanblackia: produces oil with seeds
- *Terminalia spp*: used in medicine for its wood
- *Prunus africana*: used as firewood, timber and medicinal
- Cashew: especially for the value of its nuts and its resistance to drought

Respectful Cultivation Practices

Also known as Good Agricultural Practices (GAPs), crop practices such as crop rotation, composting, and integrated pest management can be used to reduce chemical fertilizer use and pesticides. For example, crop rotation can help reduce reliance on chemical pesticides to control plant diseases, while composting can increase nutrient availability and improve soil structure.

Farm economy

Agroecology also incorporates the importance of the farm's economic viability. Beyond the positive impacts on the environment (at landscape level: preservation of habitats; at plot level: improvement of agricultural biodiversity), crops must also be economically profitable. This is an important condition for reinvesting in the maintenance and development of sustainable plantations. The sale of products other than cocoa, semi-processed or diversified (fruits, handicrafts…) is thus an encouraged lever to supplement cocoa revenues and to remedy external shocks such as a worldwide drop in the cocoa price or a natural disaster destroying part of the crops.

5.6.2 Agroforestry

To go beyond the intensive model that involves a continuous expansion of cultivated areas, agroforestry is often presented as one of the credible solutions to renewing Africa's ageing cocoa trees. As an example, in Central America and despite the variability of conditions and plots, a cocoa tree in agroforestry can reach 1,100 kg/ha/yr. of cocoa without fertilizer supply or up to 900 kg/ha/yr. in Cameroon after 20 years of operation (JAGORET ET AL., 2014). The cocoa tree grown in an agroforestry environment can benefit from trees protecting it and limiting the consumption of inputs (shade, hosts of auxiliaries), nourishing it (capture of airborne nitrogen) and allowing the farmer to diversify his income (timber, fruit, medicinal...) (JAGORET ET AL., 2020). Current research indicates that shaded cocoa production also has ecological benefits, for example, improved water retention, biodiversity (habitats for fauna and flora) allowing for increased pollination, as well as improved resilience to climate change (WINDLIN ET AL., 2021). Thus, cocoa grown in agroforestry offers a range of benefits, particularly on an economic level: lower input costs, generating money during the "hunger gap" through timber, diversifies income through fruit sales. These benefits are due in particular to the multiscale impacts of agroforestry: on the plot since it resurfaces the soil and allows shade, on the farm where this type of agriculture creates a diversification of resources and on the terrain where it provides an ecosystem service. This opportunity could thus complement the farmers' remuneration and secure a more sustainable and responsible production.

According to CIRAD, one of agroforestry's many advantages is the possibility of co-benefiting trees' carbon absorption, and thus triggering new modes of operation (voluntary carbon market) by moving from a storage of 10TeqCO2/ha for cocoa monoculture to 75TeqCO2/ha in agroforestry (CIRAD, 2020).

In the ARS 1000 standard, agroforestry is recommended as one of the practices to be promoted as part of sustainability. The experts mobilized at the end of 2022 in Côte d'Ivoire proposed different modalities to refine these recommendations[4]:

Table 2: Different agroforestry models promoted by the ARS 1000 standard.

Models	Features	Objectives	Woody shrub species used
1. Trees inside the cocoa plantation	The device comprises two types of tree species: • Layer 3 forest species • Layer 2 forest species Number of trees: 25 to 40	• Establishment of shade • Biodiversity • Diversification of sources of income • Carbon sequestration • Climate change	• 3 forest timber species • Layer 2 forest species • Layer 1 woody species

[4] Coffee and Cocoa Council and FIRCA, 2022: Workshop to define technical standards for agroforestry in cocoa farming, 01 – 04 August 2022, Hôtel le Rocher, Yamoussoukro.

	per ha • Minimum 3 species including at least 1 of layer 3	adaptation	
2. Trees in and around the plantation	• Model 1 and Planting or maintaining rows of trees around the plantations (width to be determined according to the available space)	• Model 1 objectives, including in addition: ○ The demarcation of plantations with trees ○ Fighting bushfires ○ Barrier against CSSVD	• Layer 3 forest species • Layer 2 forest species • Layer 1 woody species • Species for barriers
3. Bocage	• Planting or maintaining rows of trees around the plantations (width to be determined according to the available space).	• Demarcation of plantations with trees • Fighting bushfires • Barrier against CSSVD	• Species for barriers
4. Improved fallow with trees	• Combination of shrub legumes and forest trees	Agroforestry arrangements for the installation of future cocoa trees	• Leguminous species • Layer 3 forest species • Layer 2 forest species

Dynamic Agroforestry

Dynamic agroforestry (DAF) is defined as a spatially and temporally well-planned system that mimics a highly productive juvenile forest through key management practices. Key management practices can enable farmers to increase cocoa productivity while restoring their degraded land. According to the experts queried during the study, dynamic agroforestry would be the agroforestry option to be prioritised for an effective increase in yield (observation of plots at more than 2 tonnes/ha/year on different territories).

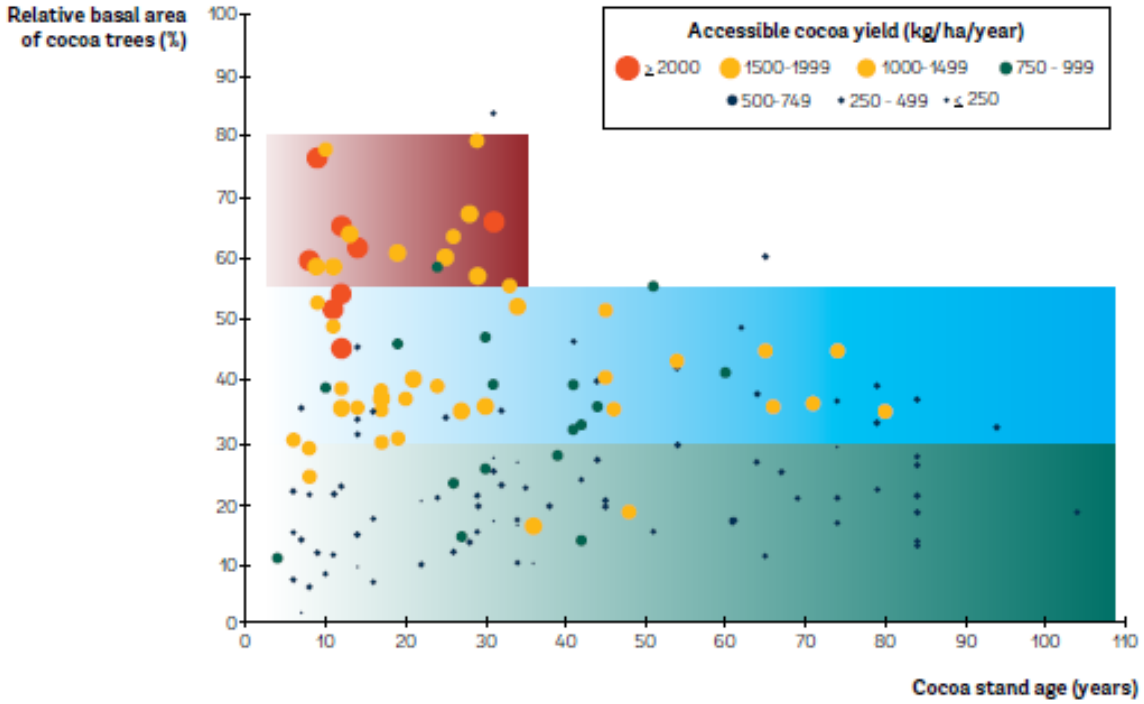
Agroforestry and cocoa production: what compromise?

In the context of cocoa-based agroforestry, the question of the shade level requires balancing several parameters: the cocoa yield, the longevity of cocoa, other crops and the fight against pests and diseases through the management of shade and air circulation. In studies that CIRAD conducted in Cameroon, faced with this balance between the average cocoa yield and longevity cocoa, an optimum was measured proposing a land area between 30 and 55% as the optimal level (Box 2). In this optimum 30-55% zone, the rate of 30 to 40% is particularly interesting, with good yields even after 40 years. This balance, which could solve many challenges of agroforestry and full sun agriculture, is only possible with the farmer's great involvement in terms of plot development and maintenance.

Box 2: Balancing cocoa longevity and its yield according to the shade level (measured as a function of the cocoa trees' land area) Sources: Saj et al., 2017; Jagoret et al., 2020.

A 40-55% relative basal area of cocoa stands - pledge of a good trade-off between cocoa yield and cocoa stand longevity

In this study carried out in Cameroon (Central region), each dot in the figure represents a cocoa agroforestry stand and its size is proportional to its commercial cocoa yield, with yields ranging from less than 50/kg/ha to more than 2 t/ha.



In the centre of the figure (blue), Cocoa agroforestry stands have optimal characteristics. Yields are close to or above 1 t/ha of cocoa, and this performance lasted well over 40 years. These stands have per-hectare mean of 137 associated tress. The relative basal are of cocoa trees ranges from 30-50% – cocoa tress represent on average 9.3m² and associated tress 11.4m².

In the upper part of the figure (brown), cocoas tree cropping is not sustainable. The stands are simple with a per-hectare means of 70 associated tress. The relative basal area of the cocoas tress is over 55% – that of cocoas tress is 8.6m² on average, while that of associated trees is 3.9m². Yields can reach over 2 t/ha, but these cocoa tress do not last more than 30 to 40 years as they are hard to maintain, even with chemical inputs such as fertilizers.

Conversely, in the lower part of the figure (orange), cocoa tress cropping is sustainable but low yielding. The stands are complex, with 176 associated trees per hectare. The relative basal area of cocoas tress is less than 30% – cocoa trees represent 5.1m² and associated trees 24.4m². Yields range from less than 50 kg/ha to 750 kg/ha..

Source: *Saj et al., 2017 et Jagoret et al., 2020*

When the World Bank prepared a guide to good practices in the context of cocoa exchanges between Latin America and West Africa, critical points were identified at the various cocoa tree production phases, to ensure that the system is sustainable. This table summarizes these particular points of attention grouped according to the three phases of the technical itinerary presented previously:

At the time of plot establishment:

Step / activity	Good practices
Year 0 Vision co-building	● Ensure consideration of the farmer's production objectives and the balance between short-term income and deferred income, ● Then infer the plantation's long-term planning and design In addition to economic considerations, several scenarios guide the choice of associated species (CCC, 2015): ● Improved "fallow" (a plot planted with fast-growing legumes and used a few years later for growing cocoa), ● Selected trees (trees left by the producer at the creation of the plantation for their utility) ● Planted trees (trees planted in the cocoa orchard at the time of its creation), ● Preservation of local species (trees that appeared spontaneously and maintained for specific needs) ● Boundary planting (trees planted along the contours or boundaries of a plantation), ● Protective strips (fence or barrier with trees or shrubs planted to serve as protection or sanitary barrier)
Selection of planting site (new orchards)	● The site must be zero deforestation. ● Ecosystem protection: establishing plantations away from wildlife shelters, not cutting down trees in the forest to establish new plantations, creating protected areas by planting trees and other plants on the shores, maintaining vegetation cover, using diverse and indigenous trees (CHED, 2016) ● Integrated water resources management: keep some distance between the plantation and water sources, prevent water contamination caused by chemical runoff, avoid dumping waste into waters, handle and store manure/ fertilizers/ agrochemicals to avoid contamination (CHED, 2016) ● Choose relatively flat terrain ● Vegetation: as far as possible, maintain local tree species instead of cutting them all down and then planting exotic trees for shade. If there are well-known adverse effects (such as diseases or parasites), then the farmer should avoid certain species.
	● Be sure to consider the conventional characteristics expected of cocoa soils (water retention properties and good drainage, clay-lime, organic matter content, pH: 5,0-

Step / activity	Good practices
	7,5) and environmental ones (annual precipitation between 1.500 mm and 2.000 mm; periods when the precipitation is less than 100 mm per month, which must not exceed 3 months)
Preparation (new orchards)	● Cleaning: No fire. ● Erosion prevention: If the inclination of the slope is high => dig trenches perpendicular to the flow of water. Plant fast-growing herbaceous species in trenches. ● Weeding: Integrated management, associations, no herbicide (agroforestry practice should reduce weed pressure) ● Pegging: Spacing compliance (3mx3m or 3mx2.5m)
Seed choice	● A mix of the "French" (resistance to shade and longevity of plants) and "Ghana" (high yield) varieties is preferred to take advantage of both and ensure a harvest despite potential climate damage (HEYMANS,2020).
Planting (case of new orchards)	● Respect of planting holes' dimensions. It is a key element for good rooting and growth of cocoa trees and associated trees. Recommended dimensions: 60cmx60cmx60cm (minimum 40cm) ● The soil quality is also important to feed the young plants. It is recommended to return the surface earth to the bottom. ● Do not overcrowd afterwards.
	● In addition to bananas, installation of legume species such as fast-growing Gliricidia to provide shade, use nutrients and produce biomass
	● Prioritize mulching from leaf scraps
	● Installation of complementary trees (fruit, nuts, wood, etc.) in an adequate spacing for future shade and density objectives
Mulching	● Spread dry plant materials around the base of the cocoa plant towards the end of the rainy season. (CHED, 2016).
Planting (case of rehabilitation)	● Identifying and replacing any old or diseased cocoa trees to at least 800 cocoa trees/ha. ● Open spaces (areas already empty or soon to be left by the old cocoa trees to be plucked) offer the opportunity to install the other species (fruit trees and timber). Locate the holes of light while respecting spacing of species to ultimately achieve the optimal shade sought (Climate Focus, 2020). ● Weed and clear areas where plantains are dead or

Step / activity	Good practices
	sick and low-yield cocoa has been removed ● Planting on plot boundaries

Then, during the cocoa development trees (within 4 years):

Step / activity	Good practices
Temporary Shade Management	Thinning or elimination of weak, malformed, diseased or low-yield banana trees that are no longer desired in the system.
Gap Filling	If thinning and regular felling of trees to manage shade creates large openings, fill with young shoots intended to: ● Diversify age classes (cocoa or other priority species) ● Ensure long-term continuous production, and/or integrate new species or varieties to diversify production (Climate Focus, 2020)
Soil cover	Cover plants in the early years. Use of cover crops such as *Mucuna puriens*, tropical kudzu (*Pueraria phaseoloides*), *Stylosanthes sp.*, can normally be planted between rows of young cocoa plants to manage weeds on the farm (CHED, 2016).
Size	Size is important to facilitate cohabitation between species. To form the size of the cocoa tree, regularly remove with a pruning shear or sharp knife the malformed stems and dry twigs to have a single stem with a 5-pointed crown. If the crown is low, leave 1 to 2 dry twigs on the crown; if the crown is well formed it is necessary to regularly remove the dry twigs with a flush cut. The pruning is conducted in years 3 and 4 (CCC, 2015; CHED, 2016).
Weed management	Focus on soil cover and manual weeding (3 to 4 times a year). Gradual closure of the canopy will also control weeds.
Pest management	Adopt good cultivation practices (weeding, shade adjustment, branch size, etc.) to avoid the development of insects (caterpillars, psyllids, leafhoppers, bark beetles, termites) (CHED, 2016)

Finally, during the cocoa plant's maintenance and production phase:

Step / activity	Good practices
Temporary Shade Management	● At maturity, the shade will be around 30%; the trees must be managed accordingly. ● Wood harvesting and continuous regeneration of shade and diversity: during this phase, the producer begins to selectively harvest wood and can benefit from long-term investments. Replacement of the specimens and filling of openings that emerge as a result of selective harvesting

	must be planned. ● The grower can initiate the stand replacement plan, remove dying or underperforming individuals, and plant replacement seedlings in the gaps.
Maintenance pruning and quilting	● Clear the cocoa trees of dry twigs and parasitic plants and epiphytes as well as dead or sick branches and stems regularly. ● Removal of dry twigs: with a pruning shears or a machete for twigs at hand and with a pruning shear or pruning knife for higher dry twigs, cut regularly for the trunk (flush cut). ● Size of parasitic plants: red flowers and berries/yellow flowers and blue fruits): cut or tear regularly with a pruning knife, a pruning knife or a machete until they are completely removed from the planting by cutting the parasitized branch just below the loranthus (3 to 5 cm) to avoid leaving a cut that could bloom again

The application of these agricultural practices still encounter certain obstacles (otherwise they would still be applied) such as, among others:
(i) the funding /income is not enough to hire skilled labour, or even decrease part of the temporary harvest to allow replacement of old plots;
(ii) beliefs and trainings slowing farmers' application of more sustainable practices (agroforestry associated with vulnerability to diseases). This is why farmers' schools and technical training are essential.

Today, we have many tools to pool efforts and implement recommendations (see Needs and toolkit available for action).

6 Needs and toolkit available for action

From the consultations conducted and the feedback from other cocoa projects in West Africa, it was possible to list the needs that often recur with practitioners, field operators and producer organizations. These needs are as follows:

Needs	Questions
Field Implementation Techniques	What are the technical routes to install or support the transition to sustainable agroforestry cocoa farming? What is the trade-off between cocoa production, shade and agricultural diversification? How to manage shade? What choice of species and crops to associate with cocoa in the context of sustainable agroforestry? Are there technical guides for the implementation of sustainable plots?
Traceability and transparency	What tools and methods to trace cocoa and monitor deforestation risks including disturbances under the canopy?
Environmental Protection and Rights	How to ensure the conservation of forests and biodiversity around the plots? How to ensure respect for the rights of local communities?
Financing	How to finance the first years of the transition to sustainable cocoa farming? How to manage the risk at the local producer level?
Property Risk Management	As agroforestry and sustainable cocoa farming in general require long-term efforts, how can the farmer be assured of reaping the benefits?

6.1 Technical implementation needs in the field

Tool	*Involved regions*	*Author(s)*	*Year*	*Themes*	*Useful links*	*Uses*	*Comments*
Cocoa Agroforestry Library	World	Mighty Earth	2021	Scientific articles on cocoa agroforestry French, English, Spanish	https://www.zotero.org/groups/2785774/cocoa_library/library	Lessons learned and useful links for plot installation (scalability, sustainable practices…)	Current literature to co-construct sustainable cocoa projects
Good practice cocoa guide	West Africa, Côte d'Ivoire	Cuts International		Control of cocoa production stages Staff management of cocoa farms Pest Management & Agro-chemistry Ivorian regulatory requirements Cocoa processing steps	https://www.allianceforproductquality.de/wp-content/uploads/SPS-Manual-CIVfr.pdf	Training on improving the quality of cocoa beans for cooperatives, exporters (complete sector) Capacity building on export quality to obtain a premium price Start of a cocoa processing workshop	Higher physical quality of beans can generate a financial means to finance sustainable techniques Section 1: P.13 - 77

Tool	*Involved regions*	*Author(s)*	*Year*	*Themes*	*Useful links*	*Uses*	*Comments*
Guide to respect for the rights of Indigenous peoples and local communities	World	AFI - Accountability Framework Initiative	2019	Definitions and legal requirements on respect for the rights of peoples Land law, land use and property Food security Self-governance Right to culture	https://accountability-framework.org/wp-content/uploads/2020/06/DO_Respect_Droits_PACL-v2.1.pdf	To be considered when setting up a project involving territories and local populations	To co-construct sustainable cocoa projects and preserve the environment
Roadmap to a sustainable cocoa sector in Liberia	Liberia	Liberia National Cocoa Public - Private Partnership Platform	2022	Guide to develop the cocoa sector in Liberia in a sustainable way	https://www.idhsustainabletrade.com/uploaded/2022/01/Liberia-Roadmap-4.3.pdf	To be used during the development of an emerging sector (case of cocoa in Liberia)	
Managing Soils for Increased Productivity and Decreased Deforestation in Cocoa, A training manual for field officers	West Africa (Ghana, Côte d'Ivoire, Nigeria, Cameroon)	Cocoasoils, Asare R. and Nlend-Nkott J.P.	2020	Producer Plot Diagnostic Tool Pruning Weeding Good use of pesticides Integrated disease and pest management Planting shade trees Mat management Organic nature of soil Good application of mineral fertilizers	Available through IITA	Gradual transition for agriculture to enable the transition from conventional to agroforestry	Accompanying trajectory from sunny plot to agroforestry

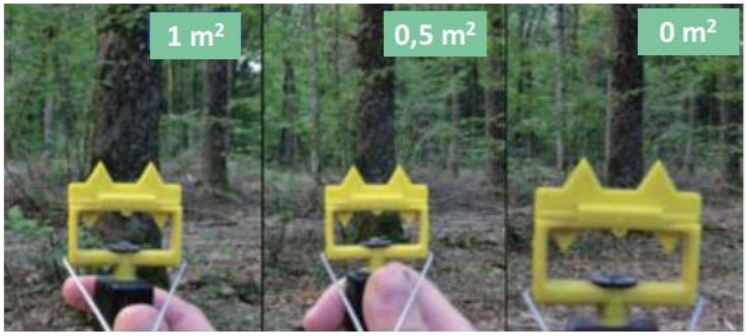
Tool	*Involved regions*	*Author(s)*	*Year*	*Themes*	*Useful links*	*Uses*	*Comments*
Cocoa trees: a collection of farmers' knowledge on the interactions between companion trees and cocoa trees in Côte d'Ivoire	West Africa	Nitidae	2022	Tree species for use in AF plots	https://www.nitidae.org/files/3d5cd5ec/les_arbres_des_cacaoyeres_recueil_de_connaissances_paysannes_sur_les_interactions_entre_arbres_compagnons_et_cacaoyers_en_cote_d_ivoire.pdf	Installation of an AF plot Diagnosis of a plot for choice of species to be conserved	
Agroforestry systems for cocoa production: valorisation and transition	Côte d'Ivoire	Nitidae	2019	Highlighting the land area (cocoa/timber production) Aid for measurement in cocoa parcel	https://www.nitidae.org/files/9cdad243/un_referentiel_dynamique_developpe_par_nitidae_pour_des_systemes_agro_forestiers_de_production_du_cacao_valorisation_et_transition.pdf	Installation or rehabilitation of plots in agroforestry	Management of shade and biodiversity of cocoa species The NGO recommended the proportion of 5m2/ha (i.e. 10 tC/ha) to trigger a payment for ecosystem services. Nitidae also recommends gradually moving towards the threshold of 8 m2/ha which would correspond to diversified agroforests, with 30% cover.
Climate-smart Agriculture in Cocoa, a training manual for field officers	Ghana	WCF World Cocoa Foundation	2018	Climate-smart agriculture Establish a plot Pest Management Shade Tree Management Soil and water management	https://www.worldcocoafoundation.org/wp-content/uploads/2018/08/climate-smart-agriculture-cocoa-training-manual.pdf	Installation or rehabilitation of plots according to climate change challenges	Easy to use plugs P.84 water management and irrigation P.93 for the culture association
Organic Certification Audit Preparation Manual	World	AVSF		Assistance in preparation for obtaining organic certification	https://www.avsf.org/fr/posts/2835/full/manuel-de-preparation-a-la-certification-biologique	Support for cooperatives in transition	

The question that often arises for practitioners in the field and producers concerns the right compromise between cocoa production (dependent on the density of cocoa per hectare and productivity per tree), shade and biodiversity. Recent publications (Sanial E., 2018; Jagoret P., 2020; Nitidae, 2019) confirm the interest of two indicators: land area to manage shade rate and cocoa production and the classification of associated species into remnant, spontaneous and planted species concerning the diversity of associated trees (Box 3).

Box 3: Land area, a key indicator (Nitidae, 2019)

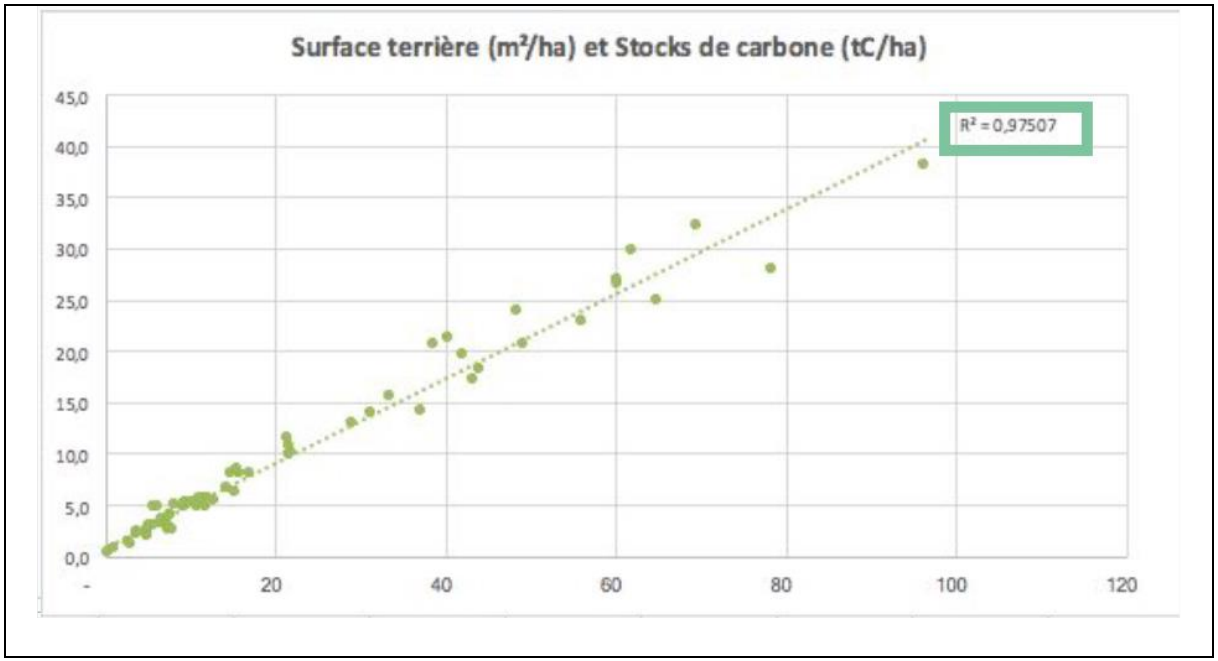
The land area of a tree (g) is the area of the trunk that rises to breast height (1.3 m). It is measured in m^2.

Stand land area (G) is the sum of tree land areas in one hectare of land. It is expressed in m^2/ ha.



Current studies show a correlation between land area and shade level (Jadan et al., 2015; Silva et al., 2020).

In addition to the shade level, a study conducted by the NGO Nitidae in eastern Côte d'Ivoire showed a close relationship between land area and carbon stocks. Based on evidence from its fieldwork, the NGO recommended the proportion of 5m^2/ha (10 tC/ha) to trigger a payment for the ecosystem service. However, the NGO also recommends gradually moving towards the threshold of 8 m2/ha which would correspond to diversified agroforests, with 30% cover. 30% is precisely one of the three criteria of Côte d'Ivoire's official definition of the forest.


Surface terrière (m²/ha) et Stocks de carbone (tC/ha)
45,0
40,0
35,0
30,0
25,0
20,0
15,0
10,0
5,0
0,0
-
20
40
60
80
100
120
R² = 0,97507

6.2 Transparency and traceability needs

Tool	*Involved regions*	*Author(s)*	*Year*	*Themes*	*Useful links*	*Uses*
Guidelines to ensure risk assessment, traceability	World	AFI - Accountability Framework Initiative	2019	Definitions and track to build a robust traceability system.	https://accountability-framework.org/wp-content/uploads/2021/08/DO_Gestio_Chaine_Approvision-v2.1.pdf	Compliance with rules and best practices for traceability and risk assessment
Starling	World	Airbus, Earthworm Foundation		Mapping system for accurate observation of changes in forest cover.	https://www.starling-verification.com/	Conduct joint massive satellite monitoring of deforestation today with the governments of Côte d'Ivoire and Ghana and the private sector.
CIV Cocoa and coffee producers card	Côte d'Ivoire	CCC	2022-23	Traceability system to the producer to track the quantities sold and prices received.	https://news.abidjan.net/articles/715076/distribution-annoncee-des-cartes-professionnelles-des-producteurs-de-cafe-cacao-de-la-zone-de-divo	Use by producers, buyers and control bodies to obtain accurate and quantitative data
Sentinel Images (20m) TropiSCO Software	World (not West Africa at the moment)	CNES, GlobEO, Cesbio	2022	Weekly forest cover loss maps from Sentinel-1 satellites.	https://www.tropisco.org/	Monitoring of changes in forest cover or basement. Can be useful during a reforestation or land use project
Sentinel-1 and Global Forest Watch images	World	Airbus, Agrosatellite	2022	Monitoring of forest cover losses from Sentinel-1 satellites.	https://www.globalforestwatch.org/	Monitoring of changes in forest cover or basement. Can be useful during a reforestation or land use project (fee)
RA policy for cocoa traceability	Côte d'Ivoire, Ghana,	Rainforest Alliance	2022	Obligations and guidance for traceability.	https://www.rainforest-alliance.org/wp-content/uploads/2022/07/SA-P-AF-6-V2.3EN-Politique-concernant-la-Certification-des-	To be used to certify RA cocoa and also as a reference for traceability

Tool	*Involved regions*	*Author(s)*	*Year*	*Themes*	*Useful links*	*Uses*
chain	Nigeria, Cameroon				Exploits-Agricoles-et_de-la-Chaine-de-Trac ¢ abilité-pour-le-Cacao.pdf	
Understanding the specialty cocoa market	Europe	CBI	2020	Specialty cocoa, quality cocoa	https://www.cbi.eu/market-information/cocoa-cocoa-products/speciality-cocoa/market-potential	Advocate for the importance of high quality cocoa for the current market and farmers

6.3 Environmental Preservation Needs

Tool	*Involved regions*	*Author(s)*	*Year*	*Themes*	*Useful links*	*Uses*
Image box on child labour, hunting, dangerous practices	West Africa	Cocoa Initiative		Prevention of child labour in the field Rights of children Prevention of hazardous practices (sharp objects, fire, chemicals, game hunting)	https://www.cocoainitiative.org/sites/default/files/resources/Boite-à-images-Lutte-contre-le-TE_ICI_2019_small.pdf	Awareness-raising in cooperatives Awareness West African societies' perception of children
Free, Informed, Prior Consent: Definition, key elements and use	World	AFI - Accountability Framework Initiative	2019	Definition, rules of use, areas of application and key elements in local communities' rights	https://accountability-framework.org/wp-content/uploads/2020/06/DO_CLIP-v2.1.pdf	New Land Use or Natural Resource, Land Conservation, Licensing
Guidelines for training rangers in the fight against poaching in and around protected areas	World	PAMS Foundation	2016	Biodiversity, poaching Theories and practical cases - human rights training modules, protected area management, wildlife protection for field staff	https://www.internationalrangers.org/wp-content/uploads/Anti-poaching-Training-Guidelines-French-Directives-anti-braconnage.pdf	Training for rangers to protect biodiversity and stop poaching

Tool	*Involved regions*	*Author(s)*	*Year*	*Themes*	*Useful links*	*Uses*
HCV / HCS method	World	HCS Approach	2020	Methodology for differentiating forest areas and areas with high conservation value	https://highcarbonstock.org/	The methodology was developed with the aim of ensuring a practical approach to implementing commitments to end deforestation.
Various tools to encourage wildlife protection and biodiversity	World	SWM program		Legal, implementation tools to reduce illegal hunting, more sustainable diet guide…	https://www.swm-programme.info/fr/knowledge-hub	During the implementation of a wildlife and biodiversity conservation project. Numerous tools to involve local communities in decisions and the application of new modes of operation
Wildlife Conservation Projects	World, Focus Cameroon and Congo Basin	Zoological Society of London		Toolkit for taking wildlife into account in production forest management activities recommendations/instructions/ready-to-use templates for loggers and their partners	https://www.zsl.org/what-we-do/projects	For forest operators and their partners wishing to conserve biodiversity in forests Legal context
Tool for the protection of humans and wildlife crops	World	CIRAD	2014	Toolbox to preserve human activities of wildlife	https://ur-forets-societes.cirad.fr/content/download/4361/35171/version/1/file/DOC_OUTILS_Final_1510_basse_resolution.pdf	For the protection authorities

6.4 Funding Needs

The implementation of sustainable practices potentially has initial costs that the farmer cannot bear 100%. Without going for a complete subsidy, it is necessary to meet this demand through technical assistance (training), financing in kind (equipment) and cash (labour for example). In this context, several cocoa projects use mixed financing composed of grants (from public or private projects, matching grant or not) and loans (microfinance for example):

- **Grants**, awarded directly by a development agency to a project. These grants are significant resources but insufficient to meet the magnitude of the needs. However, public funds can have a leverage effect on other private financing as part of the spread of sustainable practices.

- **Matching grant**. This mechanism consists of a development bank offering financing for projects respecting a specific set of specifications. Companies that propose the project must also commit a minimum capital. These programmes finance up to 50% of a project that companies conduct if it meets sustainability requirements. Several donors can be solicited: AFD, AWAC, GIZ, BNP Foundation, PPECF, Precious Forest Foundation, etc.
- **Loans**: granted by a private fund dedicated to financing sustainable agricultural practices or provided by microfinance. Côte d'Ivoire has pilot projects, such as the partnership between Advans and the Equity 2 programme (AFD/FFEM)[5].
- **Purchase of carbon credits**: This mechanism works rather as a method of remuneration for services rendered (strengthening conservation and reforestation), they allow financing tree planting in farmers' cocoa farms.

According to Eticwood, here are some funding opportunities:

Organization	**Author(s)**	**Themes / scope**	**Useful link**	**Financing Scheme**
Farm-fit	IDH, USAID	Aims to improve business relationships with small producers or support innovations to develop new services to producers.	https://www.idhsustainabletrade.com/farmfit-fund/	Mixed-financing system
ABCfund AgriBusiness Capital Fund		Investing in smallholder farmers and small-to-medium-sized enterprises (SMEs) in developing countries to support sustainable and inclusive agricultural value chains.	https://www.ifad.org	Mixed-financing system

[5] For more details on the financial needs of cocoa producers in Côte d'Ivoire, consult the report entitled Feasibility study "Cocoa Agroecological Transition Fund in Côte d'Ivoire" - Equity Programme (programme-equite.org)

Organization	Author(s)	Themes / scope	Useful link	Financing Scheme
AgriFI		The fund aims to increase returns and income. It is characterized by adherence to strong social and environmental criteria, support for value chains that create additional jobs, improve food security, and strengthen their social and environmental practices.	https://www.agrifi.eu/	Mixed-financing system
Agri3fund	HDI	Contributing to a sustainable and efficient agriculture Preventing deforestation and boosting reforestation Improving rural living conditions	www.idhsustainabletrade.com	Mixed-financing system
FISEA	Proparco	Capacity Building for Firms Tech. support to project creation	www.proparco.fr/en/page-thematique-axe/fisea	Mixed-financing system
LDN Land Degradation Neutrality Fund	Mirova	Support for projects that generate added value for producers and investors through: - Agricultural practices increasing yields and quality - Sustainable certification (Fairtrade, Rainforest Alliance or FSC) - Payments for ecosystem services such as carbon credits Processing equipment for producers and linking cooperatives with international buyers	https://www.mirova.com/fr/	Mixed-financing system
&Green		Inclusive agriculture and forest protection The objectives of the &Green Fund are to: - Catalyse $2 billion by &Green - Protect, conserve or restore 5 million hectares of rainforest Benefit 500,000 households through increased yields and incomes, job creation, etc.	www.andgreen.fund/	Mixed-financing system
Livelihoods3F		Aims at raw materials produced by small agricultural producers that concentrate on many environmental, social and logistical issues: cocoa, palm oil, mint, vanilla, sugar, carrageenan and water. It invests in large-scale projects that enable farmers to produce more and better through sustainable farming practices. The aim is to strengthen the link between family farms and business supply chains. In addition, the projects benefit society as a whole: preservation of biodiversity, management of water resources, sequestration of CO2.	http://www.livelihoods.eu/	Mixed-financing system

Organization	Author(s)	Themes / scope	Useful link	Financing Scheme
Gold Standard	WWF	Carbon certification and socio-economic development of local communities	https://www.goldstandard.org/	Voluntary Carbon Market Financing Scheme
VCS	Voluntary Carbon Standard	Carbon certification based on GHG quality	https://verra.org/programs/verified-carbon-standard/	Voluntary Carbon Market Financing Scheme
CCB	Climate Community Biodiversity & VCS	Benefits to the climate, local communities and biodiversity. Agriculture, forestry or land use projects.	https://www.climate-standards.org/ccb-standards/	Voluntary Carbon Market Financing Scheme
FT Climate Standard	FT international and Gold standard	Supporting communities and smallholders to produce fair 'carbon credits.' Democracy, transparency, guarantee of a minimum price of carbon credit.		Voluntary Carbon Market Financing Scheme

6.5 Property Risk Management

The rights related to property ownership are the right to use this property (*usus*), to benefit from the fruits this property produces (*fructus*) and to dispose of this property as we wish (*abusus*). When this is applied to a tree, the owner will therefore have the right to use it, to receive the profits it generates and to dispose of it. In a context of agroforestry deployment, the question of tree ownership arises regarding both the status of the forest tree planted on a farm and the natural tree located in a forest area (Kinomé and FCPF, 2022).

In some West African countries, such as Côte d'Ivoire and Ghana, many laws regulate the ownership of land, trees and forests. Nevertheless, local farmers' lack of awareness makes it difficult to understand the regulations and multiplies the interpretations given to the texts; this can lead to disputes and influence the practices of agricultural and forestry actors.

Table 3: Tree and land tenure opportunities for agroforestry (FAO and ICRAF, 2019)

Field of action	Opportunity
Customary land tenure (or socially legitimate land systems): often constitutes a brake on the adoption of agroforestry today (species of trees belonging to communities, planting trees considered as a means of claiming land and therefore prohibited to migrants, etc.).	Very flexible and legitimate in the communities. It could be modified to include agroforestry through, for example, state-sponsored arrangements. This is the case, for example, in Ghana, where the government is considering a mechanism for sharing timber revenues between the landowner and the migrant.

Land formalisation: state recognition of customary laws and ownership; tools can enable landowners to exercise their rights.	National laws have changed a great deal in recent years. They prepare for the stabilization of land use and grant land certificates to reduce competition on land use (see the example of the REDD+ la Mé project in Côte d'Ivoire).
Conditional land tenure and long-term leasing: State granting of secure long-term rights for harvesting specific tree products, in exchange for the application of good practices in natural resource management.	State control of the transfer of its own land that could force conversion to agroforestry.
Community Land Management: participatory process to establish rules for land use management. Organizations could support this as facilitators.	A way to bring together actors (such as shepherds and farmers) for the adoption of agroforestry. Opportunities to examine the adequacy of customary rules with agroforestry, while engaging stakeholders in respecting the boundaries between conservation and development.

7 Lessons learned and recommendations

7.1 Review of general recommendations ideas from review of other programmes and studies

Thematic recommendations are listed below. References are given for further study.

- At the agronomic and technical level

Recommendations	Source
Integration of farmers' knowledge into agroforestry promotion schemes	Sanial, 2019b
Integration of local needs (demand for food products, non-timber forest products) and producers' motivation to engage in projects adapted to their social, economic and natural environment	Climate Focus, 2020 Gockowski et al, 2010
Establish a training programme for farmers based on sustainable practices adapted to the local context (agroforestry, preservation of the specific landscape's forests)	World Bank 2022 Climate focus 2020
Regeneration of ageing cocoa orchards in agroecology	Asare & David, 2010
Replanting of orchards affected by swollen shoot in agroforestry and/or agroecological systems	Asare & David, 2010 CCC, 2015
Integration of tree legumes in agroforestry systems	CCC, 2015
When the regulatory context allows, dissemination of seedlings of grafted cocoa for better robustness and guarantee of productive stems; grafting of old stems also allows extending the cocoa tree's commercial cycle while waiting to be able to replant.	As a reminder
Large-scale communication (public-private partnerships) to halt child labour and deforestation	As a reminder

- Transparency and traceability management

Recommendations	Source
Defining common performance indicators for all programmes so that all actors are accountable	MIGHTY EARTH, 2019
All companies that have made zero deforestation commitments must keep them and suspend relations with suppliers of cocoa from recent deforestation (before 2017)	MIGHTY EARTH, 2019
Each player in the chocolate value chain must publish the origin of their supply (intermediaries and cooperatives)	MIGHTY EARTH, 2019
Deployment of mobile payments to ensure traceability to the farmer	MIGHTY EARTH, 2019
Continue the mapping efforts conducted in the producer countries, and initiate them as soon as the chain is installed for the countries starting to produce (Liberia in particular)	As a reminder
Mapping when new plots are installed to guarantee traceability as soon as they are put into production and to facilitate placing traced cocoa on the market	World Bank 2022

- Environmental Protection

Recommendations	Source
Integration of farmers' knowledge into AF promotion schemes	Sanial, 2019b
Recruitment, training and remuneration of field workers responsible for the preservation of protected areas and forests	MIGHTY EARTH, 2019
Pre-Conservation Area Mapping (HCS HVC)	Rainforest Alliance 2020
Framing cocoa farming development to avoid destruction of biodiversity habitats	As a reminder
Strict adherence to rules to curb encroachment on protected areas	World Bank 2022
GAP training, agroecological techniques, financing of conversion to organic	As a reminder
Act against illegal gold mining and poaching in conservation areas	As a reminder

- Financing

Recommendations	Source
Need for cooperation between actors on the ground, funders, politicians, industry, NGOs and local civil organisations	World Bank, 2022
Developing public-private partnerships in producer countries to meet needs.	World Bank 2022
Better remuneration of producers by increasing the price per kg (depends on cocoa processors)	Cocoa barometer, 2019
Communication on the percentage of agroforestry and full sun cocoa as a selling point for buyers	As a reminder
Export tax mechanism to finance mapping/georeferencing ($/tonne exported not georeferenced)	MIGHTY EARTH, 2019

- Policy and regulations

Recommendations	Source
Need to involve local population in establishing new regulations considering their needs and their role in conservation	
Regular and solid field control (public and private co-financed) for identification of illegal cocoa trafficking (from deforestation)	MIGHTY EARTH, 2019
Forest countries must establish and enforce strong laws to preserve their forests before their disappearance (Liberia, Sierra Leone, Guinea…)	As a reminder
Coordinating conservation and sustainable cocoa interventions at government level to pool financial resources (allocation of areas according to means and actors)	As a reminder
Establishment of standards that require all cocoa to move to agroforestry and prohibit all previous deforestation to be labelled (any label combined); effectively monitoring standards to ensure their proper role	Comparison of labels
Support maintenance of existing diversified agroforestry systems (rather than encouraging simplified cocoa/wood combinations or towards monoculture).	As a reminder
Need for cooperation between actors on the ground, funders, politicians, industry, NGOs and local civil organisations	As a reminder

7.2 Possible way to develop sustainable cocoa

7.2.1 Situation 1: areas where cocoa farming begins

In these areas, programmes can be started on a sustainable basis from the outset: respect for zoning, choice of sustainable technical routes, appropriate accompanying measures, preparation for the enhancement of cocoa and other products on favourable niches.
To ensure projects' sustainability, focus on long-term projects was emphasized, with partnerships between public and private actors. Involving all stakeholders from the project construction and design seems necessary, in particular, considering the populations' wishes and needs, state representatives' commitment at the local level and at the level of decision-makers, support towards market access (partnerships with committed private companies) and regular support for farmers in improving farming and post-harvest methods.

7.2.2 Situation 2: area where cocoa farming has already been introduced but on perfectible bases

The first step is to diagnose the situation to consider corrections, because improvements can be of different kinds:

- Techniques: for example, monitoring problems of too low or too high density of cocoa trees or ageing of a large number of non-productive stems, presence of diseases, problems of plot aeration or excessive shade, …
- Economic: low valuation of cocoa, non-linear forest products, fruits; market access problems; low quality due to poorly controlled post-harvest operations
- Organizational: disorganized supply, unstructured producers.

Among the most common problems encountered, probably the wrong agronomic choice can have the most potential impact on the forest. With underproductive plantations due, for example, to a high rate of non-productive stems (because of poorly selected pods), a planter may be tempted to compensate by expansion. In the same way, the short term search for maximum yields through full sun techniques can lead to the plantations' abandonment to their exhaustion and the clearing of new fronts.

7.2.3 Situation 3: area where good practices are already in place

In these areas where sustainable agronomic practices are already in place, it may be interesting to go further in enhancement by sustainable certification programmes recognized worldwide. Enhancement can also be developed by on site processing of the first manufacturing steps (roasting, grinding, cocoa paste) to bring part of the added value on the territory or in national chocolate factories from the bean to the finished product (chocolate bean to bar) when demand is already present or emerging.

7.2.4 Summarized Analysis

STRENGTHS:	WEAKNESSES:
• Important sector in the country's economy: first agricultural export hub for many countries studied • Farmers' Cooperatives Association • Willingness to transition to sustainable cocoa within the sector • Enhancement of sustainable cocoa through a certification system	• Too low remuneration for producers • Bottleneck in processing and distribution • Low social acceptability of some sustainable practices • Environmental impacts of current methods • Lack of sector structuring • Failure to respect certain human rights • In some countries, a significant proportion of cocoa comes from classified forests.
OPPORTUNITIES:	**THREATS:**
• Development of new traceability technologies • Funding from international programmes such as REDD+ • Many tools to be mobilized to "improve" the sector	• Climate change • Smuggling between neighbouring countries • Volatile market price with current global overproduction • Poorly developed research by country

8 Conclusion

In the world of cocoa, commitments, internal labels and corporate sustainability programs are almost exclusively based on improving productivity (through agricultural techniques in particular). On the other hand, agricultural intensification shows little effectiveness in terms of conservation and protection of forests and biodiversity. Growing global demand since the 1970s and low productivity per hectare have driven a production increase, especially due to expansion of cultivation areas from 4 to more than 10 million ha worldwide. For at least half of the area, this expansion was possible at the expense of natural forests favoured by the "forest revenue" and also the generalization of full sun crops that require cutting down the upper layers (IDDRI, 2019). This is why the main issue of sustainable cocoa associated with the preservation of forests is traceability to the plot, since even certification labels like Rainforest Alliance and Fairtrade have not been enough to reduce forest degradation.

Also, many sustainability practices exist and are to be adapted according to the areas and the parcels' history (cocoa, crops, forests). The implementation of GAPs, establishment of agroforestry systems, and agroecology are the major technical recommendations. Diversification of income through diversification of crops and activities (processing) is essential to move towards producers' greater resilience. Today, many national and international programmes and projects integrate tools and recommendations at local and national levels. Prior consultation of the various actors who have worked subsequently on the development of agricultural sectors of rent would save time and efficiency for project leaders.

In this perspective, the challenge of economic incentives at the producer level for environmental conservation is unavoidable. The implementation of GAPs and virtuous agroforestry systems generates additional costs that are currently too poorly compensated and which other payment mechanisms such as carbon credits or environmental services could supplement.

The global cocoa demand continues to grow and provides sales opportunities for cocoa-producing countries. In December 2022, CIRAD identified four ambitions for sustainable cocoa sector development for the next ten years: (i) rehabilitation of cocoa trees through the mobilization of agrobiodiversity (ii) the contribution to development of markets combining production sustainability and quality (iii) research to know, maintain and promote the genetic diversity of cocoa trees and (iv) strengthening cocoa producers' autonomy and capacities.

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10 List of interviews conducted as part of the study

BASTIDE, 2022: Excerpt from a telephone interview with Philippe Bastide on 21.12.22 on the theme “agroforestry, genetics and cocoa farming methods in West Africa”, conducted by the Kinomé team.

BELIGNE, 2022: Interview with Vincent Beligné on cocoa in Côte d’Ivoire and the Tai-Grebo-Krahn-Sapo landscape, 17 November 2022 by Kinomé.

GOLA, 2023: Interview with Alade Adeleke on the Gola landscape of PAPFor, 25 January 2023 by Kinomé

KOFITUO, 2022: IITA Cocoa Varieties Researcher Rich Kofi Kofituo interviewed on 17 January 2023 by Kinomé

WABICC WABILED, 2022: Interview with Eugene Cole, Adeleke Wale and Nohou Ndam on the WABICC WABILED programme, 21 November 2022 by Kinomé

WCS, 2022: Interview with Andrew Dunn and Imong Inaoyom on the Landscape WCS Cross River as part of PAPFor, 30 November 2022 by Kinomé

WWZ, 2022: Interview with Neus Estela, Delphine Ayerbe and Koighae Toupou on the WWZ landscape,
16 November 2022 by Kinomé

Appendix 1: Thematic references and useful links

During the exchanges, the various stakeholders expressed the need to compile in one place the different literature sources useful to landscape managers and forest conservation projects located in areas where cocoa production also exists. This non-exhaustive summary addresses the study's main themes:

Topics	*Involved regions*	*Reference*	*Author(s)*	*Year*	*Title*	*Useful links*	*Attention Reading Zones*
Cocoa agroforestry, cocoa productivity	Costa Rica Côte d'Ivoire Ghana Cameroon	DEHEUVELS , 2011	Olivier DEHEUVELS	2011	Compromis entre productivité et biodiversité sur un gradient d'intensité de gestion de systèmes agroforestiers à base de cacaoyers de Talamanca, Costa Rica	fr/https://agritrop.cirad.fr/587332/1/DEHEUVELS.pdf	Shade Cocoa Agronomy P.23 - AF Production P.34 -
Cacao agroforestier, Associations possibles, Produits Forestiers Non Ligneux	Côte d'Ivoire	NITIDAE, 2022	NITIDAE	2022	Les arbres des cacaoyères, Recueil de connaissances paysannes sur les interactions entre arbres compagnons et cacaoyers en Côte d'Ivoire	https://www.nitidae.org/files/3d5cd5ec/les_arbres_des_cacaoyeres_recueil_de_connaissances_paysannes_sur_les_interactions_entre_arbres_compagnons_et_cacaoyers_en_cote_d_ivoire.pdf	49 p.
Agroforestry cocoa,	Côte d'Ivoire	SANIAL, 2019	Elsa SANIAL	2019	À la recherche de l'ombre, géographie des systèmes agroforestiers émergents en cacaoculture ivoirienne postforestière. Université Lyon 3, CIRAD. 340 p.	https://scd-resnum.univ-lyon3.fr/out/theses/2019_out_sanial_e.pdf	

Agroforestry cocoa, peasant practices	Côte d'Ivoire	SANIAL, 2019b	Elsa SANIAL	2019b	À la recherche de l'ombre, géographie des systèmes agroforestiers émergents en cacaoculture ivoirienne postforestière. Dissertation defence - Université Lyon 3, CIRAD. 340 p.	https://www.nitidae.org/files/de5c2772/a_la_recherche_de_l_ombre_geographie_des_systemes_agroforestiers_emergents_en_cacaoculture_ivoirienne_post_forestiere.pdf	p.20; 24
Standards, Corporate Sustainability Program,	World	BASIC, 2016	BASIC	2016	La face cachée du chocolat, une comparaison des coûts sociaux et environnementaux des filières conventionnelles, durables et équitables du cacao. 20p.	https://www.coordinationsud.org/document-ressource/face-cachee-chocolat-basic-2016/	
Cocoa economy, distribution of value and costs in producer countries, decent income differential	Côte d'Ivoire, Ghana, Cameroon	FAO and BASIC, 2020	FAO and BASIC	2020	FAO and BASIC. 2020. Étude comparative de la répartition de la valeur au sein des filières européennes de cacao-chocolat, Résumé Exécutif. Paris. 16p.	https://lebasic.com/wp-content/uploads/2020/06/BASIC-DEVCO-FAO_Etude-chaine-de-valeur-Cacao-Resume-Executif_Exemplaire-Anticipe_Juin-2020.pdf	P.8 ; 14
Standard, production management, traceability	World	ISO, 2019	ISO	2019	ISO 34101-1: 2019: Sustainable and traceable cocoa — Part 1: Requirements for cocoa sustainability management systems	https://www.iso.org/obp/ui/#iso:std:iso:34101:-1:ed-1:v1:en	
National sustainable cocoa initiatives		**,**				https://www.vie-publique.fr/sites/default/files/rapport/pdf/286664.pdf	

Referencing sustainable cocoa studies and initiatives		,				https://www.cocoainitiative.org/knowledge-hub/resources?type=30	
Cocoa and deforestation recommendations	Côte d'Ivoire, Ghana	Mighty earth, 2019	Mighty earth	2019	Behind the wrapper : Greenwashing in the chocolate Industry	https://www.mightyearth.org/wp-content/uploads/Chocolate-Report_english_FOR-WEB.pdf	P.12
Summary of research on sustainable cocoa Socio-economic, gender, adaptation and climate change mitigation climate change mitigation, production systems, governance, transformation and sensory analysis		Swiss Platform for Sustainable Cocoa, 2022	Swiss Platform for Sustainable Cocoa	2022	Book of Abstracts - latest Research of Swiss Research Institutions	https://www.kakaoplattform.ch/fileadmin/redaktion/dokumente/ISCR_2022_Book_of_Abstracts.pdf	summaries of analytical contributions and solutions that ISCO research partners have developed in recent years
Best agronomic management practices and sustainable fertilizer use in West African cocoa production	West Africa	IITA , 2022	Leonard Rusinamhodzi (IITA, Ghana), Stefan Hauser (IITA, Nigeria), Ekatherina Vasquez Zambrano (WUR, Netherlands, Richard Asare (IITA, Ghana), Bernard Vanlauwe (IITA, Kenya), Ken Giller (WUR, Netherlands)	2022		https://www.iscrsymposium.org/wp-content/uploads/2022/12/25_05122022_1400_pasteur_Leonard_Rusinamhodzi.pdf https://www.iscrsymposium.org/wp-content/uploads/2022/12/25_05122022_1400_pasteur_Leonard_Rusinamhodzi.pdf	
Mapping areas of opportunity for agroforestry	Côte d'Ivoire	Cocoasoils, 2021	Cocoasoils	2021	Cartographier les Zones D'opportunite pour L'agroforesterie	https://cocoasoils.org/wp-content/uploads/2022/01/202112_Mapping-Potential-for-Cocoa-Agroforestry-Report_10-	

					Cacaoyère en Côte d'Ivoire	FR-online.pdf
Traceability system	Côte d'Ivoire	Vasquez and. Al. , 2022	Ekatherina Vasquez, Wageningen University & Research, The Netherlands Lotte Woittiez , Joost van Heerwaarden, Arun Pratihast	2022	Innovative digital data collection in collaborative cocoa fertilizer trials	https://www.iscrsymposium.org/wp-content/uploads/2022/12/24_05122022_1400_pasteur_Ekatherina_Vasquez.pdf
Traceability system	Cameroon	NITIDAE, 2022	NITIDAE	2022	Traçabilité, transparence et durabilité dans la filière cacao au Cameroun	https://www.nitidae.org/files/b4aa5b8c/tracabilite_transparence_et_durabilite_dans_la_filiere_cacao_au_cameroun_presentation_.pdf

Appendix 2: Description sheet of cocoa-related activities in PAPFor projects

GOLA LANDSCAPE drafted by Mamadouba Yaya Soumah

Name of person entering info	Sierra Leone, Liberia
Landscape Name	Transboundary Forest Landscapes of the Greater Gola
Project Environmental Axis Activities	Sustainable cocoa farming
Activities of the project's social axis	Work with 3 major associations of nearly 2000 farmers, promote the improvement of cocoa farmers' livelihoods, reduce child labour, promote young people and women's rights to land and crop ownership.
Number of beneficiaries concerned by the project(s)	1,766 farmers in the Gola forest in Sierra Leone and 105 cocoa farmers in the Gola forest in Liberia.
Project-hosting associations /NGOs	The Ngoleagorbu Cocoa Producers' Union (GOCFU) brings together three farmers' associations - the G Cocoa Producers' Association: Gaura Cocoa Farmers Association (GACFA), comprising 446 farmers (22% women) from 13 communities/villages in the Gaura Chieftaincy; The Tunkia-Koya Cocoa Farmers Association (TunKoCFA), comprising 470 farmers (15% women) from 34 communities; The Malema Cocoa Farmers Association (MACFA), comprising 850 farmers (27% women) from 35 communities in the Malema Chieftaincy.
PapFor partner associations /NGOs	Royal Society for the Protection of Birds (RSPB), Society for the Conservation of Nature of Liberia (SCNL), Conservation Society of Sierra Leone (CSSL)
Description of actions on cocoa	
Major Success 1	Creation of a farmers' union from three associations bringing together nearly 2,000 farmers from 82 communities

Tools / Materials to illustrate success 1	technical support and advice to rehabilitated old/abandoned cocoa farms, clearing, pruning, mulching, replanting with new plants of shade-tolerant cocoa species
Major Success 2	incomes for farmers from the premium and the market in Europe
Tools / Materials to illustrate success 2	agreement on the use of old farms and degraded areas for cocoa growing, planting to promote agroforestry in cocoa growing
Major Challenge 1	Willingness to continue to support
Reasons for Major Challenge 1	short-term projects such as WABiCC (5 years), WABiLED (4 years), PAPFor (4 years) long-term projects (7-15 years),
What changes have been made for future projects?	key component for cocoa farmers, promote land-use planning and deforestation-free agriculture.
Major Challenge 2	lack of collaboration between actors in the agriculture and forestry sectors
Reasons for Major Challenge 2	lack of projects to promote collaboration and the development of synergies between the initiatives
What changes have been made for future projects?	Design an innovative project with a key component on partnerships, border activities of the Agreements, more union of cocoa farmers, explore local processing, green fertilizers, avoid chemical use.
Other comments	include a small research component on human-wildlife conflict resolution.
Major Success 1	Growing awareness of the need to promote cocoa-forest coexistence/cohabitation and willingness of the EU-PAPFOPr USAID WABILED to support this promotion.
Tools / Materials to illustrate success 1	consultation reports on the current situation of cocoa-forest coexistence in West Africa, a conference planned to validate the report and plan the next steps.
Major Success 2	eU-PAPFor and USAID-WABiLED partnership to address the study of cocoa-forest coexistence collaboratively.
Tools / Materials to illustrate success 2	Focus on the main remaining forest landscapes Gola, TGKs, OKMO, OKKPPS, ZWW/WWZ, Calabra-Cameroon
Major Challenge 1	Limitation of funding, weak implementation of the “cocoa zero deforestation” programme in Côte d’Ivoire, Ghana

	and Nigeria/Cameroon.
Reasons for Major Challenge 1	Lack of follow-up and pragmatism, limited involvement of the private sector
What changes have been made for future projects?	Lack of strategies at ECOWADS/EUMOA, MRU/UMR, national and landscape level to implement cocoa-forest coexistence.
Major Challenge 2	Short-term regional initiatives such as EU-PAPFor and USAID-WABiLED
Reasons for Major Challenge 2	Funding gaps
What changes have been made for future projects?	Long-term projects, strong policy/strategy with an implementation component. More collaboration between projects
Other comments	Promoting collaboration between the forestry, mining and agricultural sectors
Major Cocoa/Forestry Programs in the Landscape	Lack of link with agriculture for forestry projects and lack of forestry component in agricultural projects - it is necessary to promote blending/link.
Inception issues: How was the cocoa sector envisaged? As an answer to what issue?	Emphasis on production, without considering the need for a balanced approach to energy production and forest and biodiversity conservation.
Solution considered: How is cocoa or the promotion of good practices related to existing cocoa a solution?	Dialogues between mining, forestry and agricultural projects to promote backfilling after mining, no water pollution, no use of chemicals, no forest clearing to grow cocoa from the mine, promote green manure, mulch, use improved cocoa varieties that tolerate shade, promote smart agriculture.

Challenge or different technique to grow cocoa?	Lack in the area
What are the challenges facing climate change in the area?	the need for smart agriculture and the use of climate-resistant varieties
Is there a regulation for the ownership of trees in the area?	there is no regulation on trees. In the MRU, however, the landowner is seen as owner of the tree for the moment.
Do you have any technical problems with cocoa farming?	Yes, at all levels, there is a lack of seed supply, land security, techniques or improved production. The number of dissemination workers is limited, slash-and-burn cultivation, drying techniques are also lacking, marketing is a problem.
What methods of cocoa cultivation do you implement?	traditional, burning, planning the seeds that one obtains, cutting down trees, no knowledge of agroforestry, improving varieties in disadvantaged areas,
Do you have technical problems with forest conservation?	yes, there is a lack of drying, storage and commercial techniques.
Are you facing financial obstacles? Which ones?	ready to clear farms, harvest, dry and market
What are the lessons learned in disease and pest management?	the lack of dissemination workers on the ground with good experience in disease control, lack of funding to treat farms facing disease problems, varieties' low resistance to disease and climate change.
What lessons have been learned about	Looking at the patterns of deforestation and cocoa production in Côte d'Ivoire, deforestation and high cocoa production overlap and move from eastern Côte d'Ivoire to the west. Zero deforestation in cocoa production does

biodiversity conservation?	not work effectively.
What are the lessons learned about shade tree management?	Cocoa seeds and plants that tolerate shade are very limited.
What are the lessons learned about land and tree tenure?	Tenure is predominantly male-driven, and young people and women tend to be excluded. The inclusion of young people and women in the land tenure systems of cocoa production must be promoted.
Do you have any comments? Recommendations?	Privatize the forest to better conserve it, train and support farmers to protect the remaining forest plots and plant more trees in degraded areas.

ZIAMA FOREST LANDSCAPE drafted by Nohou Ndam

Country concerned	Guinea Liberia
Landscape Name	Ziama Forest
Project Environmental Axis Activities	Agricultural Council (Agroforestry & Agroecology), Participatory Land-Use Planning
Activities of the project's social axis	Support for community development in villages bordering the Ziama forest: training, support for producer structuring, preservation of biodiversity.
Project-hosting associations /NGOs	GRET and FFI
PapFor partner associations /NGOs	MGE, ADCAP
Description of actions on cocoa	Past projects: 2017 to 2021 FFI (DARWIN): the installation of cocoa nurseries, training on technical routes (cocoa, coffee, palm trees, pepper, timber), establishment of field schools for market gardening and distribution of ginger, cowpea, peanut, corn, rice seeds to groups and 2020 to 2022 GEF/MANO: training and installation of agroforestry nurseries (cocoa, coffee, palm tree, pepper, and timber) and establishing field schools for palm, cocoa, coffee and forest species to support groups.
Major Success 1	Training on technical routes of different forest and agroforestry discourse
Tools / Materials to illustrate success 1	picture boxes, video, technical agricultural equipment
Major Success 2	Training on the technical routes of food crops (corn and rice) and vegetable crops (eggplant, chilli, tomato, okra) and composting
Tools / Materials to illustrate success 2	picture boxes, video, technical agricultural equipment
Major Challenge 1	Improvement of agricultural practices
Reasons for Major	preservation of the Ziama Biosphere

Challenge 1	
What changes have been made for future projects?	Monitoring and support of past projects' intervention areas with a view to sustainability.
Major Challenge 2	Increase in crop yields for reduction of entropic actions on the forest
Reasons for Major Challenge 2	Improvement of living conditions in the villages bordering Ziama.
What changes have been made for future projects?	monitoring and support of past projects' intervention areas with a view to sustainability.
Other comments	2019 - 2020 WA-BiCC (West Africa Biodiversity and Climate Change): training on technical itineraries (robusta coffee and market gardening) and on manufacture of biopesticides and establishing field schools (eggplants, peppers, okra, ginger, corn, cowpeas, rice, peanuts, cassava...). Several activities have been conducted to improve the local population's living conditions and to preserve the Ziama biosphere.
Major Success 1	Studies of markets in the cocoa and pepper sectors and agroforestry/Agroecology
Tools / Materials to illustrate success 1	Kobo toolbox survey and usage sheets
Major Success 2	Restitution of studies, identification of actors in the two cocoa and pepper sectors, village storage stores and relay farmers
Tools / Materials to illustrate success 2	Identification sheets
Major Challenge 1	Know the constraints and assets related to these sectors and improvement of their market
Reasons for Major Challenge 1	Support the actors of the two cocoa and pepper sectors (training, structuring...) to make quality products
What changes have been made for future projects?	Monitoring and support of current projects' intervention areas with a view to sustainability.
Major Challenge 2	Provide training for improvement of agricultural practices
Reasons for Major	increased yields and to obtain quality products

Challenge 2	
What changes have been made for future projects?	monitoring and support of current projects' intervention areas with a view to sustainability and bringing other agropastoral innovations
Other comments	Much demand for robusta coffee, oil palm, small cola, fishponds, lowland development, beekeeping...
Major Cocoa/Forestry Programs in the Landscape	Production, processing (fermentation and drying) and marketing;
Initial issues: How was the cocoa sector envisaged? As an answer to what issue?	Lack of mastery of techniques (cultivation, local processing), insufficient maintenance, attacks from enemies, diseases and lack of structuring into groups, marketing; the sector has been envisaged to meet the actors' needs and to make them independent; To address organizational problems at the base (structuring):
Solution considered: How is cocoa or the promotion of good practices related to existing cocoa a solution?	The promotion of good practices related to existing cocoa is one solution.
Challenge or different technique to grow cocoa?	Use of the different techniques for growing cocoa are choice of seeds, nursery installation, choice of location site, respect of densities (1111 feet/ha or 1333 feet/ha) due to (3m/3 or 3m/2.5), maintenance, protection against bio-aggressors and diseases;
What are the challenges facing climate change in the area?	Intensification of agroforestry systems based on cocoa , coffee , pepper and palm trees in the villages bordering Ziama;
Is there a regulation for the ownership of trees in the area?	Yes, there are regulations for the ownership of trees in the area.

Do you have any technical problems with cocoa farming?	Attacks by bio-aggressors, diseases (rotting of pods), lack of knowledge of technical routes, insufficient manpower for maintenance work
What methods of cocoa cultivation do you implement?	Direct sowing, nursery installation, site choice, respect of densities (1111 feet/ha or 1333 feet/ha) due to (3m/3 or 3m/2.5) and association with other crops (coffee, pepper, trees, banana, avocado, mango, guava…);
Do you have technical problems with forest conservation?	Yes, technical problems are encountered in forest conservation (bushfires, abusive deforestation, encroachment of fields, carbonization, traditional beekeeping, poaching, cultural nomadism…). Lack of free and cultivable areas around the Ziama reserve
Are you facing financial obstacles? Which ones?	Yes, the financial obstacles are met (Lack of funding at the level of actors, high interest rate at the level of microfinance institutions - sometimes up to 3%)
What are the lessons learned in disease and pest management?	For the sustainability of cocoa and forests: the choice of a good variety, planting site, respect of cultural standards, interviews, cocoa associations with other crops (agropastoral, agrosilvopastoral…) are required;
What are the lessons learned about shade tree management?	Lessons learned in shade tree management include: High density shade reduces production, promotes the presence of diseases (rotting pods), bio-aggressors, the installation of parasitic plants (algae, lichens, ferns) on trunks, and tearing of the feet with few branches; Low density shade: good production, few diseases, bio-aggressive means, good branching of limbs and weak installation of parasitic plants;
What are the lessons learned about land and tree tenure?	Lessons learned about land and tree tenure include: Temporary hydromorphic soils: flooding during the rainy season which is the time of fruiting and the maturity of certain pods, often causes rot and death by asphyxiation at the root system, difficult access; Hillside soils: promote good production, little rot and mortality of plants, easy access at all times;
Do you have any comments? Recommendations?	The cocoa plantations visited are ageing, associated with other crops and trees (agroforestry), lack of soil fertilization and phytosanitary treatment, the majority of plantations are on soils with temporary hydromorphy, low yield. Recommendations: training on the technical routes, support to structuring, marketing products, supply of quality seeds, training on the production of biopesticides, organic fertilizers and the supply of fertilizing plants, training

	on the processing techniques at the local scale, storage and protection.

TAI GREBO KRAHN FOREST LANDSCAPE (drafted by Vincent Beligné)

Country concerned	Côte d'Ivoire Liberia
Landscape Name	TGKS
Project Environmental Axis Activities	Development of agroforestry systems Preservation of residual forests
Activities of the project's social axis	Development of local development plans (LDPs) for 6 villages in Côte d'Ivoire (+ 2 to come in Liberia) and support for their implementation Support to development and formalization of land use plans (Liberia) Development of makore and wild mango value chains (from the promotion of agroforestry to production of makore butter) Support for the sustainable management of village forests
Number of beneficiaries concerned by the project(s)	A few tens of thousands?
PAPFor-TGS partner associations / NGOs	NOFNA (Our Forest - Our Future /local NGO - Zagné) //YVEO (Yacoli Village Ecole Ouverte /national NGO CI) //EF-CI (Earthworm-Foundation Côte d'Ivoire / country office of an international NGO) // WCF (Wild Chimpanzee Foundation / country offices - IC & Lib - of an international NGO) //LISUPED (Lib) // FACE (Lib) // WHH (Welt Hunger Hilfe /international NGO/ Lib)
Description of actions on cocoa	Development of agroforestry by considering "friendly" or "companion" tree species of the cocoa tree that can allow the generation of additional income without decreasing income due to cultivation of cocoa (e.g. makoré). Works very well in combination with plants that are used locally (small kola, wild mango...)
Major Success 1	Promotion of makore as a cocoa "companion tree," enhancement and processing of makore butter
Tools / Materials to illustrate success 1	More than 1,000 mature makore as identified and georeferenced in the project's terroirs (in IC) & commercial outlets in Côte d'Ivoire guaranteed
Major Success 2	Participatory approach to forest preservation/ Giving (several) interest(s) to preservation

Tools / Materials to illustrate success 2	Development of social interests for forest preservation (culture, sacred character, medicinal plants for self-consumption …) and promotion of an economic interest in preservation (collections of NWFP, ecotourism)
Major Challenge 1	In Côte d'Ivoire, insufficient work on agronomic techniques (GAPs) for cocoa under the TGKS In Liberia, apart from the PPP Sustainable cocoa led for 2 years in the Grebo-Krahn space, no great mastery of agricultural techniques
Reasons for Major Challenge 1	In Côte d'Ivoire, agricultural practices in cocoa farming in the Tai area are the responsibility of ProCIV (GiZ Centre Innovations Vertes), the TGS only deals with the promotion of an agroforestry system for makore to reintroduce the tree in the rural landscape In Liberia, village communities' livelihoods relied on hunting, collecting NWFPs (toothbrushes) and sawing (illegal activities in many situations), directed towards Ivorian and Ghanaian markets Long political crises and very poor (or non-existent) road services did not promote mastery of agricultural techniques (limited access to training)
What changes need to be made for future projects?	Better integrating good agricultural practices in a holistic way, including agroforestry Also promote agroforestry systems for restoring fertility in cocoa farming (improving or regenerating aging orchards/creating plantations on previous non-forestry), with Oceanian acacias and albizzias ...
Major Challenge 2	Finding income alternatives for peripheral areas of conservation spaces
Reasons for Major Challenge 2	Communities must be compensated for the loss of access to natural resources and/or spaces that could provide livelihoods (through the provision of alternative work, finance…)
What changes need to be made for future projects?	For the exploitation of natural resources as for village forests, the incentive aspects must be improved, better integrating customary provisions and modern regulations relating to forests and land It is important to encourage innovative approaches in natural resource management and land use planning
Other comments	An additional challenge could be the reception of migrants by the local populations who generate socio-political problems (land management and 'barter' of the labour force…)

Inception issues: How was the cocoa sector envisaged? As an answer to what issue?	In Côte d'Ivoire, the history of cocoa is a history more than a century old (read "Cocoaïans" from Gauz), in response to the colonial power's needs. The need for raw materials is now transferred to multinational companies of 'Western' origin. The benefit to the country and the producers' welfare come only afterwards. Although there may reason to complain about poor pay for labour, cocoa has nevertheless become a "fetish" crop in the country. Few farmers are unwilling to indulge in it when they have access to land in favourable areas. In Liberia, the agro-pedo-climatic context is not very favourable to cultivation (high rainfall and atmospheric humidity, desaturated soils), palm and rubber trees being more suitable. Nevertheless, before the crises, cultivation developed in the border regions through the example of the sister populations of Côte d'Ivoire, and by the opportunities for a better cross-border product flow (poor practicability of the national road network) In the current context, beyond environmental restrictions (agro-pedo-climate), the irrepressible need for land for growing populations (birth rate + migratory flow) means that the cocoa "pioneer front" has crossed the Cavally River. The pressure is so strong that the Liberian authorities are publicly concerned about it (including in diplomatic exchanges between Liberia and Burkina Faso, countries bound by free "movement" - but not settlement - of people within ECOWAS), while observing that the same process that has prevailed in the west and south-west of Côte d'Ivoire, the "barter" of land for non-native labour force, is developing in the Indigenous communities.
Solution considered: How is cocoa or the promotion of good practices related to existing cocoa a solution?	While wishing for an "agro-ecological" evolution in these GAPs, often considered antagonistic with the "intensification" that could partially answer the question of land pressure, cocoa farming remains a relatively safe speculation in areas with favourable context of the Ivorian South It is also adapted to the "individualistic" model of family farming that prevails in the sector, unlike palm and rubber trees.
Challenge or different technique to grow cocoa?	In Côte d'Ivoire, there are many challenges: (i) "recovery" of 'tired' or ageing orchards due to growing in full sun (ii) regeneration of post-slaughter plantations related to the swollen-shoot, (iii) creation of new plantations on fallow or other non-forestry history/tree legumes may have an important role to play in agroforestry systems There are also the challenges of improving quality of the cocoa produced (organic transition, fermentation, drying, ...), in connection with the improvement of the purchase price to the producer In Liberia, the challenges are (i) the respect of protected areas and HVC forests (subject to their prior

	mapping) and (ii) the immediate implementation of GAPs (to avoid reproduction of the "IC model" that has failed and that the migrants want to "import" with them)
What are the climate change challenges faced in the area?	Climate change could have an improving effect on cocoa cultivation in Liberia (a decrease in sometimes excessive humidity) In Côte d'Ivoire, on the other hand, the favourable areas will be reduced to the "Taï area" (peripheral regions of the Taï NP, partly linked to an ecosystem service effect of the park and forests of neighbouring Liberia) and the Abengourou-Aboisso-Agboville triangle to the south-east /many other regions may gradually become unfavourable (see climate notice)
Is there a regulation for the ownership of trees in the area?	In Côte d'Ivoire, trees "planted" belong to the one who planted them or to the landowner (if the planter is simply "land user" and a "contract of use" establishes that the landowner will own the tree planted), inaccuracies exist as to the implementation of the Forest Code (particularly for the exploitation of the tree planted), in particular in connection with the proof of land ownership. Pre-existing natural trees are deemed to belong to the landowner according to most customs. They belong to the latter if he can prove his land ownership (certificate or title) or, otherwise, to the State (point of attention). Trees regenerated in RNA could be considered planted trees... In Liberia, customary ownership (to be verified) seems to give tree ownership to the landowner (individual or family)
Do you have any technical problems with cocoa farming?	Not an issue in Côte d'Ivoire; the agroforestry producers in our project area manage these problems In Liberia, a significant part of the problems of the sustainable cocoa PPP (GiZ / Theobroma NL) has been linked to the difficulties of moving on roads that are often impassable; selective clearing with conservation of trees chosen to stand is not easy, and burning residual trees is often unavoidable with inevitable damage to trees maintained. Production of cocoa seedlings as well as useful forest species also experienced delays
What methods of cocoa cultivation do you implement?	The agroforestry system for maintaining or introducing "companion trees" of selected useful species/ System adapted according to the partner producer's will
Do you have technical problems with forest conservation?	In Côte d'Ivoire, the scarcity of wooded land conducive to cocoa farming is a challenge to implement projects. In Liberia, the definition of land use plans enforceable against migrants by Indigenous people
Are you facing financial obstacles? Which ones?	Indirectly, through the "calibration" of planned activities (according to human and financial resources)

What lessons have been learned about biodiversity conservation?	– Awareness to supervise development of cocoa farming – Creation of pilot sites with good agricultural practices – Ensures respect for protected areas and forests with high conservation value (corridor forests/ forests periodically flooded along rivers and rivers) to stem deforestation in Liberia – Development of land use plans and their formalization in contracts involving the national structures in charge of land (Rural Land Agency - AFOR - in IC / Liberia Land Authority - LLA) – Improvement of road infrastructure – Training, support for cooperatives ...
What are the lessons learned about shade tree management?	Not having to cut down old trees to plant new ones is important, even if it poses technical problems (burning at clearing ...) Leaving a fairly flexible framework (choice of species, densities ...) so that it is adaptable according to the farmers' plots Forestry interventions (decoupling, progressive pruning, pruning ...) are important, promoting planting is not enough GAPs must not be limited to the periphery of protected areas, but must make a national promotion plan
What are the lessons learned about land and tree tenure?	Temporary recognition of customary rules could mitigate the foreseeable slowness of implementing new forest and land regulations
Do you have any comments? Recommendations?	Consider the challenge of gold panning and poaching for meat and ivory/hooves

CROSS RIVER LANDSCAPE drafted by Inaoyom Imong

Country concerned	Nigeria, Cameroon
Name of the landscape	Cross River
Activities of the project's environmental area	Strengthening the management of Cross River National Park to improve the conservation of forest and wildlife
Activities of the project's social area	Promoting sustainable, resilient cocoa agriculture and the sustainable harvesting of non-timber forest products such as bush mango
Number of beneficiaries concerned by the project(s)	The final beneficiary of the action will be Cross River National Park and the 120,000 people living in the wider landscape who will benefit from ecosystem services resulting from biodiversity conservation within the park and adjoining forest areas.
Associations/NGOs carrying out the projects	Wildlife Conservation Society
Associations/NGOs partners of PapFor	Cross River National Park
Major success 1	Reduction in levels of hunting in Cross River National Park
Tools / Materials to illustrate success 1	Spatial Monitoring And Reporting Tool (SMART) used to analyse ranger patrol data
Major Success 2	Increase in number of farmers and women's groups applying improved farming techniques and sustainable harvesting of forest products; increase in number of hectares of existing farmland where farmers introduce sustainable cocoa

	production; improved wellbeing of households in target communities
Tools / Materials to illustrate success 2	Basic Necessities Survey (BNS) used to assess changes in household wellbeing
Major Challenge 1	Difficulty accessing sufficient improved variety cocoa seedlings to supply farmers
Reasons for Major Challenge 1	High demand for improved seedlings from the Cocoa Research Institute of Nigeria (CRIN), the only cocoa research and seed development institution producing improved seedlings in Nigeria
What changes are being made for future projects?	WCS procuring cocoa pods to establish nurseries for seedlings rather than purchasing scarce seedlings directly from CRIN
Major Challenge 2	Providing adequate economic incentives to farmers to ensure that they respect conservation agreement and support the protection of Cross River National Park
Reasons for major challenge 2	Incentives the project provides are currently limited to training and provision of improved seedlings, which may not be sufficient
What changes will be made for future projects?	Work with cocoa-buying companies to improve farmers access to premiums, and investigate possible links to high-value markets including the feasibility of marketing gorilla-friendly chocolate from the landscape
Main cocoa/drilling programmes in the landscape	Small-holder extensive cocoa farming system driving rapid deforestation in the landscape due to unsustainable practices such as shifting cultivation and slash and burn

Initial problems: How was the cocoa sector envisaged? In response to what problem?	Intensive cocoa farming system focusing on improving productivity of existing farms to discourage extensive cocoa farming
Solution envisaged: How is cocoa or the promotion of good practices related to existing cocoa a solution?	Improving productivity of existing farms through planting improved varieties and applying sustainable practices reduces the incentive to clear more forest for expansion, thereby reducing deforestation
Challenge or different technique for growing cocoa?	Limited access to improved variety cocoa seedlings and lack of knowledge and skills to adopt sustainable farming practices
What are the challenges of climate change in the area?	Decrease in land suitable for cocoa production as deforestation disrupts local weather patterns, potentially leading to higher temperatures or more intense dry season, forcing farmers to expand into new areas
Are there any regulations for tree ownership in the area?	The traditional land tenure system in the landscape bestows ownership of land and all its trees on the first community member to clear an area of intact forest. Planted trees, e.g., cocoa, belong to the farm owner
Do you encounter any technical problems in cocoa farming?	A standing government moratorium logging prohibits the felling of trees for timber
What cocoa farming methods are you	Phased replanting of aged farms with improved variety cocoa seedlings to improve productivity on existing farmland, disincentivising extensive farming

implementing?	
Do you encounter technical problems in forest conservation?	Improving effectiveness of law enforcement patrols and monitoring; reducing deforestation from unsustainable agricultural practices
Do you encounter any financial obstacles? Which ones?	Funding to scale up interventions to improve the sustainability of cocoa production
Identifying solutions for sustainable cocoa and forests	Improving productivity of existing cocoa farms through training of farmers in best practices and increasing their access to improved varieties of cocoa is critical for limiting deforestation from extensive farming
What are the lessons learned about disease and pest management?	Use of proper spacing and improved varieties that are more resilient to pests and diseases promoted while discouraging use of harmful chemical pesticides
What are the lessons learned about biodiversity conservation?	Improving sustainability of cocoa production and limiting deforestation from farm expansion is enhancing protection of Cross River National Park and biodiversity conservation within the park while maintaining biodiversity corridors outside
What are the lessons learned about shade tree management?	Farmers more easily adopt use of shade trees in cocoa when economic trees (such as Irvingia gabonensis) are promoted as shade trees. Maintaining adequate shade is necessary for newly established young cocoa plants especially in the dry season to reduce water loss.

What are the lessons learned about land and tree tenure?	The traditional land tenure system in the landscape which bestows ownership of an area of intact forest land on the first community member to clear it encourages land grabbing and contributes to deforestation.
Do you have any comments? Recommendations?	Increasing economic incentives for small-holder farmers through increased access to premiums will facilitate transition to deforestation free cocoa production

Appendix 3: Internal sustainability of private companies' programmes (not exhaustive)

Name of the programme	Company	Site	Objectives of the programme
Trace-cocoa	Puratos	https://www.cacaotrace.com/fr	Internal traceability
Cocoa Horizon	Barry Callebaut	https://www.cocoahorizons.org/fr/le-programme	Cooperative training, productivity kits (EPS and distribution), traceability
Cocoa Plan	Nestlé	https://www.nestlecocoaplan.com/fr	Internal traceability, exclusion of cocoa from deforestation, shade tree planting, GAPs training
Transparency	Cémoi	https://www.transparence-cacao.com/	Internal traceability, quality of beans, planter's quality of life
Cocoa life	Modelez	https://fr.cocoalife.org/	Creating a positive impact for producers and their communities
Cocoa for Generations	Mars	https://www.mars.com/sustainability-plan/cocoa-for-generations	Strengthening the fight against child labour and deforestation
Farming program	Lindt&Sprungli	https://www.farming-program.com/en/#introducing-the-lindt--spr%C3%BCngli-farming-program	Improving living conditions of producers
Ferrero farming value	Ferrero	https://www.ferrerosustainability.com/int/en/	Sourcing raw materials in a sustainable way
Cargill Cocoa Promise	Cargill	https://www.cargill.com/sustainability/cocoa/the-cargill-cocoa-promise	Training for farmers, internal traceability

Appendix 4: Summary of Programmes and Initiatives (not exhaustive)

Summary of programmes and initiatives

Topics	*Involved regions*	*Project Initials*	*Programme, initiative name*	*Participating organizations*	*Useful links*	*Period*	*Project summary*
Combating deforestation and restoring forest areas	Côte d'Ivoire, Ghana	ICF	Cocoa & Forests Initiative	Governments of Côte d'Ivoire and Ghana, and 35 companies in the cocoa sector. Coordinating Ministry of Water and Forests (MINEF) & IDH (Sustainable Trade Initiative) in facilitation	https://initiativecacaoforets.ci/	2017	The initiative aims to eliminate deforestation and restore forest areas by prohibiting any further conversion of forest land for cocoa production.
Improvement of producer income	Côte d'Ivoire, Ghana	CIGHCI	Côte d'Ivoire Ghana Cocoa Initiative		https://www.cighci.org/	2021	The aim is to define a common (IC and GH) and sustainable cocoa strategy on this basis, with a view to sustainably increasing the prices cocoa farmers receive in their respective countries.
Protection of human rights and forced labour in cocoa	West Africa	ICI	International Cocoa Initiative	agricultural cooperatives, cocoa traders, cocoa processors, cocoa and chocolate manufacturers and non-industry: civil society organisations, certification bodies, farmers' representatives	https://www.cocoainitiative.org/fr		The ICI Foundation's vision is of prosperous cocoa-producing communities, within a dignified, sustainable and responsibly managed supply chain, where child and human rights are protected and respected, and where child labour and

						forced labour have been eliminated.
For a prosperous and sustainable cocoa sector	World	WCF	World Cocoa Foundation	https://www.worldcocoafoundation.org/		Aims to train, educate and support communities living in the cocoa industry, support field programs and scientific research, through the economic, social and environmental development of these communities.
Dialogue between distributors and traders for more sustainable production	World	RCC	Retailer Cocoa Collaboration	https://retailercocoacollaboration.com/		
Formal trade between producer countries and Europe	European Union and cocoa-producing countries		Cocoa Talks	https://knowledge4policy.ec.europa.eu/publication/cocoa-talks-eu-virtual-roundtables-sustainable-cocoa_en	2020	Establishing dialogue between actors

Environmental and Socio-Economic Risks of Cocoa	European Union	ISCO	Initiative for sustainable cocoa				The main cocoa traders, elected by the RCC members, are assessed on progress made in cocoa sustainability, covering topics such as deforestation, traceability, gender equality, farmers' incomes and child labour and forced labour.
Strengthening stakeholder dialogues	France	IFCD	Initiative Française pour une Cacao Durable				
Enhancing excellent cocoa's value in the world	World	CoE	Cocoa of Excellence		https://www.cocoaofexcellence.org/2021-edition/2021-edition-national-organisation-committees		Strengthen and enhance the market value of cocoa beans
Combating child labour	Ghana and Côte d'Ivoire	Private and ILO		ILO, ADM, Barry Callebaut, Cargill, Ferrero, The Hershey Company, Kraft Foods, Mars Incorporated and Nestlé	https://www.ilo.org/wcmsp5/groups/public/---dgreports/---exrel/documents/publication/wcms_455685.pdf	2011-2014	strengthening Business Coordination to Combat Child Labour

Reducing emissions from deforestation and forest degradation	World	REDD+	Reducing emissions from deforestation and forest degradation	UN	https://redd.unfccc.int/	2011-2015	Financing projects to reduce deforestation and forest degradation
Reducing emissions from deforestation and forest degradation	World	FLEGT	Forest Law Enforcement, Governance and Trade Programme for Forest Law Enforcement, Governance and Trade	European Union countries	https://europa.eu/capacity4dev/file/10545/download?token=8tClkaRs		Programme for Forest Law Enforcement, Governance and Trade
Clear guidelines on the implementation, monitoring, verification and reporting of agricultural and forestry supply chains	World	AFI	Accountability Framework Initiative	Businesses, NGOs and Governments	https://accountability-framework.org/	2019	Definition of the framework for establishing, implementing, and monitoring commitments to ethical supply chains.
Combat poaching	World	SWM			https://www.swm-programme.info/fr/		Community management programme to regulate hunting and prevent the looting of animal resources and tools from local communities

Appendix 5: ARS 1000-1 Regional Standard Content Summary:2021 (World Bank, 2022)

Topics	Description ARS 1000-1:2021	Reference 1000-2:2021
Management System Improvement	For the Recognised Entity: Identification of opportunities for improvement. Setting and specifying the relevant performance targets and implementing the necessary measures.	10
Requirements relating to economic aspects	• Support and training for producers to build capacity in accounting, farm business management and access to financial products. • Skills of workers, plant materials and agrochemicals adapted and controlled to promote the agronomic performance of farms and good agricultural practices at each stage of production. • The Producers' Group/Producers' Cooperative must raise awareness among its producers on crop diversification, adaptation to climate change of its production and support them in this diversification.	• 11
Requirements relating to social aspects	• Ensuring respect for human rights. • Banning illegal child labour and forced labour. • Implementing gender and youth action plan. • Preventing discrimination, harassment and abuse. • Ensuring workers a written or oral contract with witnesses and regular remuneration. • Implementing an action plan on health and safety at work. The Entity provides protective equipment required for workers in hazardous conditions free of charge. • The Entity provides access to social security for workers. • Freedom of Association and Collective Bargaining Policy.	• 12
Requirements relating to environmental aspects	Minimising the negative impact and maximising the positive impact on the environment: • Preserving plant and animal habitats • Preventing deforestation and combating climate change • Protection of water bodies • Health and environmental safety considerations related to	13

	agrochemical use	
Topics	**Description ARS 1000-2:2021**	**Reference 1000-2:2021**
Requirements for the registration of actors in the cocoa supply chain	Stakeholders in the supply chain must contact the Regulator/Legal Entity to be registered.	4
Quality requirements	Batches of cocoa beans must comply with specifications allowing them to be suitable for the manufacture of food products. Maximum limit to be respected on certain aspects (elements related to cocoa, flat beans, foreign bodies, moisture levels, sieving debris, colour, smell) as well as maximum percentage of mouldy, slated, attacked by insects or germinated beans.	6
Sampling	The sampling conducted to check compliance with the specifications of the quality requirements must be conducted in accordance with the ISO 2292 requirements.	7
Bagging/Packaging	Bags must be clean, strong enough, suitable for contact with food and properly sewn and sealed. Cocoa beans are shipped in new bags only.	8
Marking	Bags must display: the producing country, the product name, the product category, the product year of harvest, shipping marks, if applicable, any other applicable identification mark, including the verification type (Ex: ARS 1000) and net weight.	9
Test Report	The test report which records in an organised manner the data obtained from an assessment of specific parameters and describes the environmental or operating conditions must meet the requirements.	10
Principles of traceability	Traceability systems for sustainably produced cocoa must: document the history of cocoa or locate cocoa in the cocoa supply chain, contribute to identifying the cause of non-compliance and improve the appropriate use and reliability of information, as well as the actor's effectiveness and efficiency in the cocoa supply chain.	11
Objectives of traceability	Traceability objectives should be measurable, monitored, communicated to relevant internal and external stakeholders and updated, as necessary. The actor in the cocoa supply chain must keep documented information on the objectives of cocoa traceability.	12
Traceability requirements	Stakeholders shall ensure that the cocoa supply chain, including all operational units, meets the conditions set out in this Standard. The traceability system for sustainably produced cocoa must be verifiable, achievable, results-oriented and economically viable. It must provide documented information on	13

	cocoa throughout the cocoa supply chain, from cocoa farm to export (FOB) as well as locally for processors.	
Physical traceability - Cocoa segregation	The Recognised Entity and the actors in the cocoa supply chain must demonstrate that measures have been taken to avoid the mixing of compliant cocoa with non-compliant cocoa.	14
Monitoring and improvement	The actors in the cocoa supply chain must monitor the effectiveness of the traceability system for sustainably produced cocoa. They must conduct an internal audit at least once a year to verify compliance with the requirements of this Standard. Corrective measures must be put in place in case of non-conformities. Continuous improvement of the relevance, adequacy and effectiveness of the traceability system must be conducted.	15
Review	A review of the traceability, monitoring, corrective action and continuous improvement system will be conducted regularly.	16
Topics	**Description ARS 1000-3:2021**	**Reference ARS 1000-3:2021**
Regulator/Legal Entity Requirements	Guarantee and ensure the independence, impartiality and integrity of the regulator/body vis-à-vis the actors: • Obligation to have an impartial policy and to ensure its effectiveness. • Obligation to have an independent and integral Supervisory Board with identified competences	4
System Development and Management	Establishing rules for the establishment and implementation of a certification system and its proper management by the Regulator/Legal body	5
Information made available to the public	Ensuring accessibility of information relating to certification and certification bodies	6
Complaints and appeals to Certification Bodies and Regulator/Legal body	Ensure the effectiveness of the complaint process and appeals against a customer, a Certification Entity or the Regulator/Legal body itself	7
Requirements for Bodies carrying out audits for certification	Establish rules governing Certification Bodies' activity, in particular concerning the audit cycle for sustainable cocoa; audit procedures; audit methods; methods of obtaining information during the audit; the audit duration; deadlines for resolving non-conformities; expiry of a certificate; requirements concerning auditors' competence.	8

Allegations and Third-Party Compliance Marks	Set rules for the benefit of Regulators/Legal bodies governing third parties' use of claims, trademarks or certificates	9 & 10
Licensing and control	Establishing rules governing granting of an enforceable agreement governing use of certificates, marks of conformity or other indications of conformity.	11

Appendix 6: Extracts of shade tree species and agro-forestry devices adapted to cocoa farming in the peripheral area of Tai Park (Côte d'Ivoire) – Source: VARLET and KOUAME (2013)

NOM SCIENTIFIQUE	**NOM COMMUN**	**STRATE OCCUPEE**	**CYCLE DE VIE**	**INTERÊTS POUR LES POPULATIONS**					**OBSERVATIONS**		
				BCh	M	N	C	V	LITTERATURE	POPULATION	CONSULTANT
Teck grandis	Teck	3ième	Secondaire long					x		Ne connait pas le comportement	bien
Mansonia altissima	Bété	3ième	primaire	x			x	x	compatible	Bien	Pas observé
Corylus avellana	Noisette	2ième	Secondaire long ?							Bien	bien
Acacia mangium	Acacia	3ième	Secondaire moyen	x			x		compatible	Ne connait pas le comportm.	Pas observé
Acacia auriculiformis		3ième	Secondaire long	x			x	x	compatible	Ne connait pas le comportem.	Pas observé
Albizia lebbeck		3ième	Secondaire long	x	x		x		compatible	Ne connait pas le comportem	Pas observé
Albizia guachapele		3ième	Secondaire long	x			x		compatible	Ne connait pas le comportem	Pas observé
Albizia zygia		3ième	Secondaire long	x		x	x	x		Ne connait pas le comportem	Pas observé
Tieghemella africana	Makoré	Emergent 4ième	primaire	x		x		x	compatible		bien
Cocos nucifera	Cocotier	2 a 3ième	Secondaire long			x		x		Bien en plantation	bien

NOM SCIENTIFIQUE	**NOM COMMUN**	**STRATE OCCUPEE**	**CYCLE DE VIE**	**INTERÊTS POUR LES POPULATIONS**					**OBSERVATIONS**		
				BCh	M	N	C	V	LITTERATURE	POPULATION	CONSULTANT
Teck grandis	Teck	3ième	Secondaire long					x		Ne connait pas le comportement	bien
Mansonia altissima	Bété	3ième	primaire	x			x	x	compatible	Bien	Pas observé
Corylus avellana	Noisette	2ième	Secondaire long ?							Bien	bien
Acacia mangium	Acacia	3ième	Secondaire moyen	x			x		compatible	Ne connait pas le comportm.	Pas observé
Acacia auriculiformis		3ième	Secondaire long	x			x	x	compatible	Ne connait pas le comportem.	Pas observé
Albizia lebbeck		3ième	Secondaire long	x	x		x		compatible	Ne connait pas le comportem	Pas observé
Albizia guachapele		3ième	Secondaire long	x			x		compatible	Ne connait pas le comportem	Pas observé
Albizia zygia		3ième	Secondaire long	x		x	x	x		Ne connait pas le comportem	Pas observé
Tieghemella africana	Makoré	Emergent 4ième	primaire	x		x		x	compatible		bien
Cocos nucifera	Cocotier	2 a 3ième	Secondaire long			x		x		Bien en plantation	bien

NOM SCIENTIFIQUE	**NOM COMMUN**	**STRATE OCCUPEE**	**CYCLE DE VIE**	**INTERÊTS POUR LES POPULATIONS**					**OBSERVATIONS**		
				BCh	M	N	C	V	LITTERATURE	POPULATION	CONSULTANT
Anacardium occidental	Acajou	2ième	Secondaire long	x		x		x			bien
Cola nitida	Colatier	2ième	Secondaire long			x	x	x	Pas compatible	compatible	bien
Citrus sinensis	oranger	2ième	Secondaire long			x	x	x			bien
Persea americana	avocatier	2ième	primaire			x	x	x			bien
Garcinia mangostana	Mangostan					x					bien
ombrage temporaire pendant les trois premières années											
Carica papaya	Papay					x		x			bien
Manihot esculentum	Manioc	3ièm				x		x			bien
Sesbania ssp		2ième									bien
Cajanus cajan	Cajanus	2ième				x					bien
Musa paradisiaca	Banana	2ième				x		x			bien
Ricinus communis	Ricin	3ièm									bien
Bixa orellana	Djeka	2ième				x					bien