FEASIBILITY STUDY FOR CACAO AGROFORESTRY PROJECTS UNDER THE SHADING OF TIMBER TREE SPECIES (CONGO BASIN AND CÔTE D'IVOIRE)

FINAL REPORT

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ACRONYMS

AFD	Agence Française de Développement (French Development Agency)
ATIBT	Association Technique Internationale des Bois Tropicaux (International Tropical Timber Technical Association)
CADP	Commercial Agriculture Development Project
CIB	Congolaise Industrielle des Bois
CIRAD	French Agricultural Research Centre for International Development
CFI	Cocoa and Forests Initiative
CNRA	National Centre for Agronomic Research
CSSV	Cocoa Swollen Shoot Virus
ER-P	Emission Reduction Programme
FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FFEM	French Facility for Global Environment
FLEGT	Forest Law Enforcement, Governance and Trade
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICRAF	International Center for Research in Agroforestry
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
NDP	National Development Programme
PES	Payment for Ecosystem Services
PPECF	Programme de Promotion de l'Exploitation Certifiée des Forêts (Promotional Programme for Certified Forestry Operations)
PPP	Public Private Partnership
RCI	Republic of Côte d'Ivoire
REDD	Reducing Emissions from Deforestation and Forest Degradation
REDD+	Reducing Emissions from Deforestation and Forest Degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks
SPIB	Union of Industrial Wood Producers
TOR	Terms of Reference
WCF	World Cocoa Foundation
WWF	World Wildlife Fund

GLOSSARY

Agroforestry

According to ICRAF (International Centre for Agroforestry), 'agroforestry is a dynamic system for the management of natural resources based on ecological principles which integrates trees in farms and in the rural landscape and makes it possible to diversify and maintain production in order to improve the social, economic and environmental conditions of all land users'.
Agroforestry refers to all land-use techniques involving a combination of trees with multiple uses either with agricultural crops, or with animal farming, or with both, whilst respecting local traditions (Pineau W. coord., 2017).
In Côte d'Ivoire: Agroforestry is a dynamic and ecological approach used for the management of natural resources which, through the integration of trees in agricultural landscapes, diversifies and increases production whilst ensuring the enhancement of social, economic and environmental benefits for land users (CNRA, 2013).

Canopy cover

IPCC, 2003: The percentage of the ground covered by a vertical projection of the outermost perimeter of the natural spread of the foliage of plants. Cannot exceed 100 percent (also called crown closure or crown cover).

Sustainability certification

Written assurance (in the form of a certificate) awarded by a third party that a product, service or system complies with environmental requirements aimed at improving agricultural practices, banning dangerous chemical inputs, protecting biodiversity and respecting the fundamental conventions of the International Labour Organization.

Fair trade certification

Written assurance (in the form of a certificate) awarded by a third party that a product, service or system complies with fair trade requirements (see definition below).

Fair Trade

Fair Trade is a trading partnership, based on dialogue, transparency and respect, that seeks greater equity in international trade. It contributes to sustainable development by offering better trading conditions to, and securing the rights of, marginalized producers and workers – especially in the South. Fair Trade organisations, backed by consumers, are engaged actively in supporting producers, awareness raising and campaigning for changes in the rules and practice of conventional international trade.

(Definition of FINE, the coordination of Fair Trade stakeholders which includes the major international networks of Fairtrade International, the World Fair Trade Organisation and the European Fair Trade Association)

Permanent Forest Estate

FAO: Forest area that is designated by law or regulation to be retained as forest and may not be converted to other land use.

Forest

According to the FAO: Land spanning more than 0.5 hectare with trees higher than 5 metres and a canopy cover of more than 10 percent, or with trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use. The FAO's definition excludes the tree populations that are part of agricultural production systems, such as fruit tree plantations, palm oil planta-

tions, olive groves and shaded agroforestry cropping systems. The FAO suggests the term 'other land with tree cover' for the tree populations that are integrated in agricultural production systems such as fruit tree plantations and shaded agroforestry cropping systems.

Primary forest

According to the FAO, this refers to naturally regenerated forests of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.

Planted forest

According to the FAO, this refers to forest predominantly composed of trees established through planting and/or deliberate seeding. The planted/seeded trees are expected to constitute more than 50 percent of the growing stock at maturity. This also includes coppices from trees that were originally planted or seeded, rubber tree, cork oak and Christmas tree plantations, but it excludes self-sown trees of introduced species.

Private ownership by individuals

According to the FAO, this refers to forest owned by individuals and families.

Private ownership by local, tribal and indigenous communities

According to the FAO, this refers to forest owned by a group of individuals belonging to the same community residing within or in the vicinity of a forest area or forest owned by communities of indigenous or tribal people. The community members are co-owners that share exclusive rights and duties, and the benefits contribute to the community development.

1. INTRODUCTION

Oréade-Brèche and Kinomé have been shortlisted by the ATIBT to conduct a study aimed at examining the 'Feasibility of shade-grown cocoa agroforestry projects' within the FLEGT-REDD+ project funded by the FFEM. The contract was signed in December 2018 and a mission in the field was conducted in February 2018 in Cameroon and Côte d'Ivoire.

1.1 - OVERALL CONTEXT OF THE STUDY

In 2013, the ATIBT was allocated a project funded by the French Facility for Global Environment (FFEM) called 'Integration of the tropical wood industry in Central and Western Africa in the FLEGT and REDD+ mechanisms'. Within the scope of this project, the theme of forest plantations takes on a particular significance insofar as their development would induce both economic and social benefits (these are activities which generate a lot of employment for low-skilled or unskilled workers), the sustainable use of timber resources and carbon storage. The ATIBT therefore decided to engage in a broad reflection on this topic by commissioning the following studies with three different bidders:

- 'Assessment and analysis of the legal context for the integration of plantation and reforestation projects in natural forest concessions'
- 'Capitalising on learning outcomes from the experience of timber plantations in Côte d'Ivoire'
- 'Feasibility study for shade-grown cocoa agroforestry projects' The latter study is examined in the present report.

With regards to the REDD+ mechanism, shaded cacao cropping systems do not immediately appear to be the most efficient way of fighting deforestation (they could even be a factor of forest degradation) or of increasing carbon storage (compared with the implementation of high density plantations). However, shaded cacao cropping systems present extremely important benefits in terms of social and economic development, they open up significant agroecological possibilities and appear to be a very efficient means to take advantage of existing synergies between the cocoa and the forestry/timber industries. Moreover, the study also had to take into account the fact that the cocoa industry is facing difficult challenges. Two relatively recent reports have had a profound impact on the cocoa industry.

- A study conducted in 2016 by the BASIC cooperative, 'The Dark Side of Chocolate[1]', states that, because of the poor financial conditions under which the farmers execute their work, cacao trees are poorly maintained and therefore die off. In order to maintain their yields and their wages,

1. https://lebasic.com/wp-content/uploads/2016/05/Cocoa-Study_Synthesis.pdf

producers have extended their farm plots towards the forests. Thirteen million hectares of forest have disappeared in Côte d'Ivoire since 1960, partly because of cocoa farming.

• The 2017 report 'Chocolate's Dark Secrets[2]' goes even further by demonstrating, on the basis of field investigation conducted by the NGO Mighty Earth, that part of the chocolate consumed in the world now comes from protected forests and national parks in Côte d'Ivoire.

In their recommendations, the two studies call for the development of shaded cacao cropping systems as a way of fostering ecological diversity and enhancing income diversification.

Lastly, we also need to mention another reality, i.e. that climate change seems to already have an impact on Western Africa's cocoa growing territories. For instance, in 2016, a dry episode combined with high temperatures led to the withering of many Western African cacao trees, in particular in full sun clonal plantations. Moreover, climate change is leading some natural predators of cocoa pests to leave these cocoa farming areas. Some farmers have observed some resilience in the rare shaded cacao cropping systems in Ghana or Côte d'Ivoire and therefore would like to go back to the agroforestry practices of the past. States and chocolate companies are also wondering whether it is beneficial to develop 'climate smart' models among farmers because they do not want to jeopardise the sustainability of cocoa bean supplies.

1.2 - SPECIFIC OBJECTIVE OF THE STUDY ON SHADE-GROWN COCOA AND EXPECTED DELIVERABLES

The study is part of the First Component of the project funded by the FFEM and aims at bringing a contribution to the following topic: 'Development of pilot projects for innovative plantations in terms of timber, firewood and agricultural products needs'. Beyond the project, it participates in a broader reflection which consists in 'proposing a way to change the forest concession model so that tropical rainforests become a sustainable tool for the development of populations and territories'.

The aim of this initiative is to enable harvesting companies operating in natural forests to implement solutions for diversifying their activity whilst preserving the natural forest area. In order to do this, the private sector needs to have some tools available which will help it target agroforestry projects depending on issues identified and on benefits and possible funding schemes.

The particular objective of this study is to assess the feasibility of agroforestry projects with an objective in terms of timber by restoring shaded cash crop systems (such as coffee or cocoa operations) and by addressing the following challenges: what is the technical feasibility of operational and efficient models, in which regulatory and institutional contexts should they be implemented and what type of economic outlook should be expected from them?

The study focused on two countries presenting different contexts and development paths for the cocoa and forest/tim-

2. *http://www.mightyearth.org/wp-content/uploads/2017/09/chocolates_dark_secret_english_web.pdf*

ber industries in order to be able to draw as many lessons as possible from the discussions and concrete cases mentioned by the different stakeholders that we met. The table below is not intended to be exhaustive (far from it), but aims at summarising (maybe in a way which is too schematic) the main characteristics of the Ivorian and Cameroonian contexts before getting into the details of the study.

Table1: Main characteristics of the Ivorian and Cameroonian contexts

INDUSTRY	CÔTE D'IVOIRE	CAMEROON
FOREST/ WOOD	Forest highly degraded by farming which enables the harvesting of a very limited number of species mostly used for peeling (kapok, frake, framire)	Dense forest with relatively low anthropisation and with forest resources integrating diverse natural species
	Logging operation organised within Forest Exploitation Perimeters (PEFs) within which the concessionary cuts the last isolated trees or trees located in relict groves.	Forest concession under a sustainable forest management plan with a rotation of 20 to 30 years (200,000 ha maximum/FMU)
	Industrial tool capable of utilising logs with small diameters and high growth exotic species	Industrial tool adapted to heavy timber and big diameters
	Very few certified companies (2 OLB-certified companies)	Good forest certification dynamic (legality and sustainable management) since 2005 but with a sharp slowdown since 2010.
	Logging companies with large experience and skills in terms of reforestation (nursery techniques, reforestation modes). Planting of exotic species on a regular basis (Gmelina, Teak, Cedrela)	Some forest concessionaires have developed plantations of native forest tree species with ecological restoration objectives in order to respond to the planning standards and to some requirements of the FSC certification (reforestation of logging gaps or timber yards)
COCOA	First cocoa producer in the world, first source of export income (45%)	Significant cocoa producer but to a lesser extent than Côte d'Ivoire, with a more reduced source of export income (20% in good years)
	Cacao cropping systems and agricultural extension model based on direct exposure to sunlight. Cacao cultivation was one of the main drivers of deforestation.	Complex agroforestry models have remained rooted in peasant culture. More advanced agricultural research regarding shaded cacao cropping systems (CIRAD, IRAD)
	Very exposed country in terms of risks related to cocoa image. During the COP23 conference, Côte d'Ivoire and Ghana made serious commitments towards zero deforestation cocoa.	Less exposed country in terms of criticism with regards to the link between cacao cultivation and deforestation.
	The challenge is to be able to introduce more timber species within cacao crops.	The challenge is to be able to plant more cacao trees in order to boost economic development around the concessions.

1.3 - ORGANISATION AND WORK METHOD

The study is based on a significant prior documentary review and on work meetings conducted with the different stakeholders and resource persons during the field mission organised in Cameroon and in Côte d'Ivoire from the 5th to the 16th of February 2018 or during interviews through conference calls. During these working meetings, consultants have always expressed the desire to collect all relevant information but also to test/validate some work hypotheses (creation of agroforestry techniques), to diagnose a situation (part 4 of the report) or to engage in prospective reflection (project proposal in part 5 of the report).

2. THE ADVANTAGES AND DISADVANTAGES OF SHADED CROPPING SYSTEMS

2.1 - THE ECOLOGY OF CACAO TREES

The cacao tree (Theobroma cacao L.) is a small tree which grows in the undergrowth and is native to the Amazon rainforest. It requires a hot and humid climate, without any marked or prolonged dry season. The optimal rainfall is of 1,500 to 2,000 mm and cacao trees cannot withstand precipitation lower than 100 mm/month for more than three months. The relative humidity rate in the air needs to be high (optimum rate: 85%). The soil needs to have a good water retention capacity whilst having a draining effect because the roots should not be asphyxiated. It needs to be slightly acidic and its organic matter content needs to be high in the upper layer. Cacao trees are cultivated within an area located between 20° North and South of the Equator. The optimal annual average temperature is around 25°C (between 18 - 21°C and 30 - 32°C). The absolute minimum is 10°C. In addition, in order to enable optimal production, cacao trees should not be exposed to daily temperatures higher than 33.5°C for more than one month. In the next few decades, sub-Saharan Africa cocoa farmers should therefore get support so that they can adapt their practices to better anticipate a possible multiplication of climate extremes.

Being native to the Amazon rainforest, the tree can tolerate a significant level of shade. However, under these conditions, some varieties can be more sensitive to brown rot of pods (Phytophthora spp). It was also demonstrated that the production of pods can increase with light exposure if nutrient exports are sufficiently offset (especially by soil fertilisation) and if rainfall is sufficient. Full sun plantations potentially produce more but, depending on the varieties, the yields can quickly go down after 20 to 30 years because of tree

and/or soil exhaustion. In strong sunlight exposure conditions, cacao trees are also more exposed to insects such as mirids (Sahlbergella singularis and Distantiella theobroma). Complex plantations, which combine one or multiple storeys of crops and trees that are complementary to the cocoa stratum, enable farmers to extend cacao trees' lifetime but with a relatively low yield. Jagoret et al. have observed almost century-old plots in Cameroon. In addition, complex cultivation systems enable farmers to benefit from many other products and services provided by shade trees (fruits, non-wood forest products, medicinal uses, microclimate regulation, protection against drying winds, better water retention in soils – if care is taken to plant species that seek water more deeply than cacao trees' roots). Therefore, the search for an adequate environment is frequently discussed among scientific and technical teams.

In summary:
→ The cacao tree is a small tree that grows in the undergrowth.
It can therefore grow with a certain level of shade but will produce fewer pods.
→ When the cacao tree is exposed to sunlight, it may produce more pods if soil fertility enables this, but the shrub may become exhausted after a few decades.
→ In the shade, the cacao tree is exposed to fungi. In the sun,
it can be invaded by mirids.
→ There are intermediary cropping systems which combine acceptable and sustainable production of pods and access to many other products and services.

2.2 - AGROFORESTRY AND ITS POSSIBLE APPLICATIONS TO CACAO CULTIVATION

In Central and Western Africa, cocoa farming employs millions of farmers[3] and encompasses many different practices, from the complex multi-storey agroforestry landscapes in South Cameroon or Western Togo to the almost exclusive monoculture systems which predominate in Côte d'Ivoire or Ghana. These different practices have different strengths and limitations as described above and do not have the same ecological impact or sustainability level.
With regards to shaded cropping systems, they can originate from forest thinning or planting designed to create a mixed or light shade.

- Several observers report that the systems originating from forest thinning are characterised by the presence of non-hybrid varieties such as the Amelonado. These cropping systems are put in place after having cut the undergrowth and eliminated some trees considered to be harmful or of low value. In these shaded plantations, we observe a high density of large trees which give the plantations a structure that can be confused with that of a secondary forest.

3. In Côte d'Ivoire, there are between 800,000 and 1.3 million farms involved in cocoa production but it is estimated that 8 million people live off cocoa farming. In Ghana, there are an estimated 800,000 cocoa producing farms. In Cameroon, there are about 400,000 to 600,000 cocoa producing farms, and in Nigeria around 300,000 (Hütz-Adams et al, 2016).

• The systems originating from replanting have initially been implemented by cutting down almost all of the local species of trees in order to keep only a few useful species which will support cacao trees in their growth or which are difficult to fell with manual farming tools. This results in a low density of naturally large trees in the plantations in which farmers then introduce local or exotic edible species in order to ensure the shading and a diversification of the sources of income. These systems are related to the introduction of varieties of hybrid cacao trees. These systems can be implemented in old plots cultivated without shade trees, through the reintroduction of trees.

The below table attempts to present the benefits of two main types of cacao shaded cultivation systems.

Table 2: Benefits of the shaded cacao cultivation system (according to the research conducted by V. Béligné)

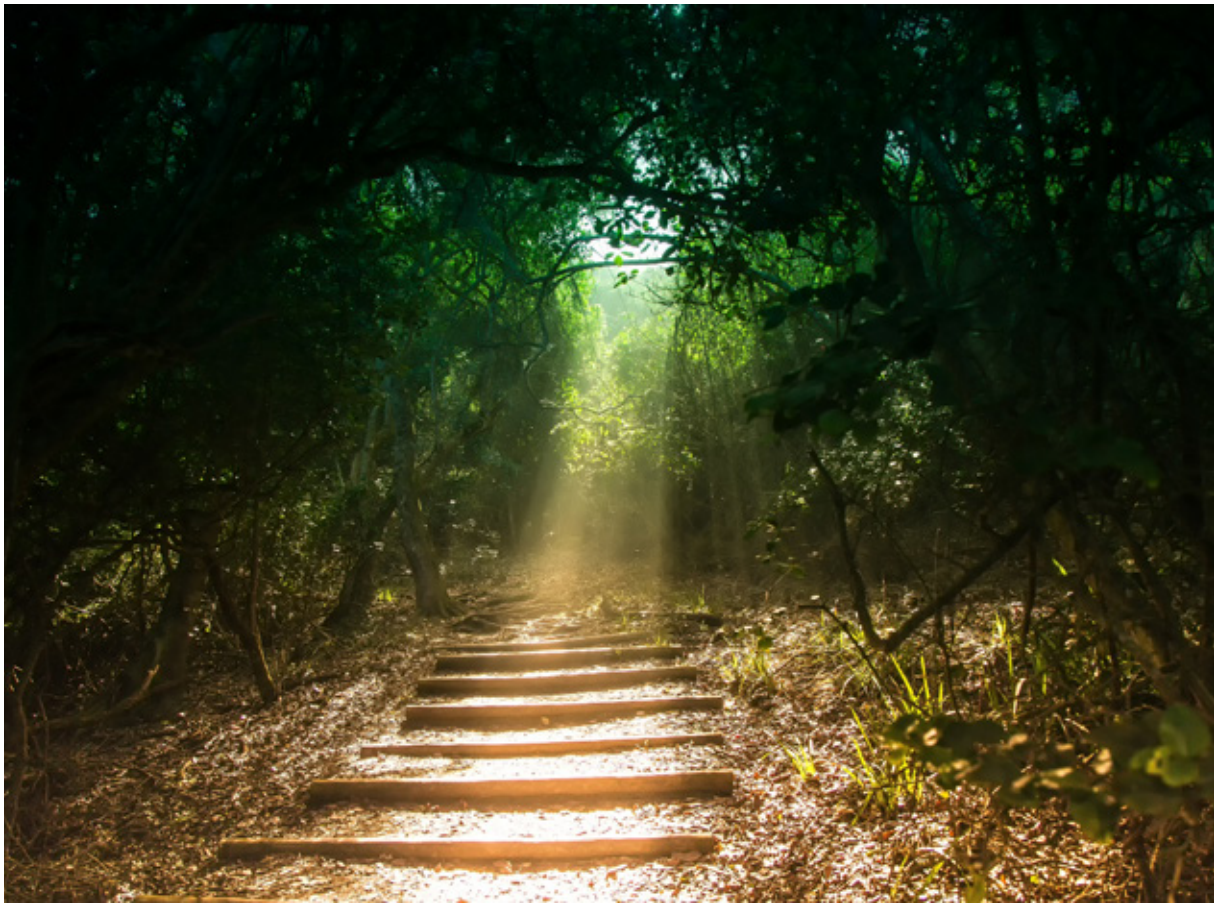
SYSTEM	GOALS	OBSERVATIONS
Complex shaded agrofo-restry systems	• Shade • Fertility preservation	Sustainability factor for the plantation, knowledge of species is quite good, both for the shade and the fertilising effect; The density of shade trees is hard to determine because it depends on the tree conformation (height, treetop shape, quality of the shade, pruning etc.); The Rainforest Alliance standard mentions 12 to 18 trees/ha with a shade rate of 40% in the long run. Other standards provide a range between 7 and over 70 trees/ha.
	• Production (fruits, pharmacopeia, fuelwood, construction wood, timber, fodder, etc.)	With adapted species according to the objectives chosen by the growers; For products gathered from naturally regenerated trees (pharmacopeia, fodder), even with growers' intervention, the perception of a resource's collective ownership with more or less free use persists. This can deter growers from preserving certain species (for instance Ficus exasperata); Tree ownership issue with regards to timber species: agricultural extension and enforcement of texts.
	• Propagation of honey plants	For beekeeping (in the event of an absence of pesticides related to a certification).
Linear agrofo-restry systems	• Delimitation of a plot or farm	This practice is not very common yet but has a great potential. It can contribute to stabilising properties but it raises the question of tree management in case there is a common ownership of these trees.
	• Cordon sanitaire	Considered as a way of fighting against the Cocoa Swollen Shoot Virus disease (viral disease endemic to Western Africa) if the hedge is relatively wide (forested belt) and composed of species which are not potential hosts.
	• Windbreak	In multi-storey hedge.
	• Preservation of water and soils	Planted along contour lines, as a partition between different plots in a farm.
	• Production (see above)	With adapted species according to growers' objectives.
	• Enclosure	In order to control the movement of cattle.
	• Propagation of honey plants	For beekeeping (in the event of an absence of pesticides related to a certification).

In order to process timber species that are present or planted within cacao crops, two constraints need to be taken into account in addition to those mentioned previously about shade quality:

• The difficulty of exploiting large trees. Two options are considered in this report – that of cutting timber at the same time as renewing cacao trees (after about 25 years) and that of planting trees in a localised way, along edges or in rows.

• Cacao diseases. In the countries affected by the cocoa swollen shoot virus disease (CSSV), some trees considered to be hosts for the virus need to be avoided. An official list exists in Côte d'Ivoire and is disseminated by the CNRA. In addition, as an appendix to the Cacao Planters' Manual (2015), the institutions in charge of the cocoa industry suggest a list of useful trees because of their shade, the possibility to process them as timber or non-wood forest products and soil fertilisation.

In summary:
→ Shaded cacao cultivation systems offer a large range of economic and environmental benefits (the following Part 3 will give us even more information on the great diversity of possible associations).
→ The cropping systems that should be recommended depend on farmers' needs in terms of income, on the social and environmental services provided by agroforestry and on risk management.



3. OVERVIEW OF EXISTING INITIATIVES IN TERMS OF SHADED CACAO CROPPING SYSTEMS

Field missions as well as a documentary review have enabled us to appreciate the multiplicity of existing experiences in terms of shaded cacao cultivation. Coming from different starting points, research institutions, environmental programmes, logging companies as well as chocolate companies are all testing 'agroforestry models' each at their own level. You will find below a list – by no means complete – of a few initiatives which have been documented:

3.1 - ONGOING PROJECTS WHICH INTEGRATE SHADED CACAO CROPPING SYSTEMS

Country	Republic of Congo 
Initiative	**National Development Programme for Cocoa Production**
Donor	Government of Congo
Context and goal	The objective of the NDP is to contribute to the improvement of the sustainable production of cocoa with a view to increasing producers' income and enabling the Republic of Congo to become a cocoa producing and exporting country again.

Development and perspectives	A private company, the Congolaise Industrielle du Bois, a subsidiary of the Olam group (CIB-Olam) was chosen to be the general contractor for the first phase of the NDP-cocoa programme (2012-2016). This phase, which is currently on hold for lack of funding, is focused on the production of plant material (3 million seedlings were produced in 2.5 years which enabled 500 farmers to plant 2,800 hectares of groves) from genetic resources originating from Cameroon and the centre of Reading (United Kingdom). These seedlings were produced from a 3 ha nursery and a 3 ha timber yard located in Pokola (department of Likouala) within one of the CIB-Olam forest concessions. In Northern Congo (departments of Sangha and Likouala), the planting which took place within the scope of this programme or before the programme existed was in general conducted in ancient forests and a significant number of trees were preserved. As we will see later, the programme aiming at a reduction of greenhouse gas emissions (ER-P) fosters complex models within these regions implementing the REDD+ intiative. The Government intends to rely on the new CADP project (World Bank) to fund a part of the second NDP-cocoa programme which is currently being studied. In any case, the AFD is planning on funding a support project for this programme. This project is detailed below.

Country	Republic of Congo 
Initiative	**Support Project for the Cocoa-NDP**
Donor	AFD
Context and goal	This project supports the Cocoa-NDP. It focuses on the structuring aspects of the industry (strong regulations, quality genetic material, adapted organisation, sustainable cropping systems) in order to create favourable conditions for relaunching cocoa production (Cocoa-NDP). Therefore, as the AFD project is being implemented, the funding originating from other main programmes could rely on these learnings in order to support the scaling up in terms of provision of seedlings, producers' funding and infrastructure. The global objective of the Cocoa-NDP is to contribute to the advent of an innovative cocoa 'from Congo' with positive impacts on producers and the environment.
Development and prospects	The project is structured around the following four main specific objectives: • To support the definition and the implementation of an institutional framework for the industry; • To support the restoration of cocoa production in villages and the emergence of a sustainable production system which has a positive impact on forests and local communities; • To support the structuring of the industry with adapted organisational, training, research, funding and sanitary control schemes; • To support innovation in cropping systems as well as the purchase of production, processing and quality control equipment.

Country	Republic of Congo 
Initiative	**Emission Reduction Programme (ER-P) of the Republic of Congo**
Donor	World Bank / FCPF
Context and goal	The Republic of Congo's Emission Reduction Programme (ER-P) aims at implementing the low-carbon development vision. This is implemented by demonstrating the feasibility of large scale alternative development approaches aimed at reducing greenhouse gas emissions, enhancing the sustainable management of landscapes, improving and diversifying local subsistence means and preserving biodiversity. At the national level, the REDD+ National Committee (CONA-REDD), the higher body for interministerial and cross-sectoral governance, will ensure the supervision and the strategic management of the Emission Reduction Programme. The area covered by the Emission Reduction Programme includes the Northern part of the Republic of Congo and is delimited by the departments of Sangha and Likouala.
Development and prospects	Shaded cacao cropping systems as part of agroforestry projects is an avenue worth exploring for the ER PIN (Emission Reduction Programme Idea Note) strategy. The project would target a surface of a little lower than 20,000 ha of degraded forests that need to be restored through cacao agroforestry projects amongst others. The initiation of this phase relies on the Forest and Economic Diversification Project (FEDP) described below.

Country	Republic of Congo 
Initiative	**Forest and Economic Diversification Project (World Bank/FEDP)**
Donor	World Bank
Context and goal	The FEDP is a project which is co-funded by the World Bank (10 million USD from the IDA) and the government of the Republic of Congo (22.6 million USD). Approved in May 2012 within the framework of the new 'Country Assistance Strategy for the period 2013-2016' and placed under the authority of the Ministry of Forest Economy, Sustainable Development and Environment (MDDEFE), the FEDP aims at 'reinforcing the capacities of the Forest Administration, of Local Communities and Indigenous Populations in terms of participatory management of forests'. The project includes three components: (i) the reinforcement of the Forest Administration's capacities (regulatory framework, information/management system and equipment – 33 vehicles, 118 motorbikes and 30 boats to date); (ii) the involvement of local communities and of indigenous populations in the management of forest resources (development of simple management plans in villages, including community development series, and funding of income-generating projects); (iii) prospective analysis on the forest/environment sector in Congo, coupled with important work on communication and agricultural extension.
Development and prospects	In the second component, 15 simple management plans have been planned in 13 forest concessions; 885 micro-projects are in the process of being financed in the following environmental services fields: cacao cultivation combined with banana crops, beekeeping and agroforestry. The concept of green jobs is at the heart of these activities which need to be able to improve the standards of living of local communities and indigenous people and also to contribute to the reforestation of degraded areas and the afforestation of savannah areas. More specifically, two partnership agreements have been signed with CIB-Olam within the framework of the FEDP aimed at providing support to local communities and indigenous populations in the field of cacao cultivation. • 1st agreement: already implemented. Cost: 601,484,572 CFA francs. 96 growers were supported in the 3 FMUs. 200 ha of cocoa/banana cropping systems were planted and support was provided to the planters for their maintenance. 160 people were trained. • 2nd agreement: ongoing. Cost: 294,697,201 CFA francs. 100 planters were provided support and trained.

Country	Côte d'Ivoire and Togo for cacao cultivation 
Initiative	**Programme Équité**
Donor	AFD and FFEM (3.9 million Euros)
Context and goal	This programme aims at developing fair trade as well as preserving biodiversity. The Équité programme supports the development of fair trade and reinforces the capacities of producer organisations and of their networks in five countries in Western Africa: Côte d'Ivoire, Burkina Faso, Ghana, Mali, Togo.
Development and prospects	In Côte d'Ivoire, the Équité programme supports five projects of cocoa cooperatives which all raise questions that need to be addressed on production, access to the market and environmental performances. Two of these five projects include agroforestry (CAN and CAMAYE). In addition, the Équité programme supports a research-implementation project on a surface of 0.5 ha each time with an assessment of the workload and of economic results. In Togo, the Équité programme also supports the efforts of a cocoa cooperative, the PROCAB, which tests agroecological practices (a combination of cacao crops, fruit trees and fertiliser trees) in the Plateaux Region.

Country	Côte d'Ivoire 
Initiative	**REDD+ / LAME / Nitidae association (formerly known as Etc Terra)**
Donor	C2D, MINSEDD (project owner), Nitidae (general contractor)
Context and goal	Côte d'Ivoire has committed to the REDD+ international initiative in order to restore its forest cover and to contribute to the fight against climate change. It implements pilot projects via the support of the REDD+ Executive Secretariate of the Permanent Council. The project is implemented on the border with the Mabi-Yaba classified forests and in the whole region in which initiatives aimed at reforestation and the fight against deforestation are supported. Its goal is to reduce the greenhouse gas emissions originating from deforestation whilst improving the standards of living of people living in these forests.
Development and prospects	This project is based on the strategic priorities of the national REDD+ initiative and involves a combination of actions on the territorial level as well as on the main drivers of deforestation: support to the development of Local Development Plans, issuance of land certificates, organic cacao cultivation with agroforestry systems (with the development of a payment for environmental services model), reforestation, support for the first operations of thinning, improved carbonisation techniques, etc.

Country	Cameroon 
Initiative	**IITA**
Donor	GIZ/SNV/IRAD/MINADER
Context and goal	The International Institute of Tropical Agriculture (IITA) wishes to intensify sustainable cocoa production and climate-smart agriculture. The aim of the project is to boost cocoa yields and to improve the inputs and the wellbeing of cocoa producers. NB. According to the World Bank, climate-smart agriculture (CSA) is an integrated approach to landscape management – cultivated land, cattle, forests and fishing – which deals with the interdependent challenges of food security and of climate change.
Development and prospects	The project will deal with producer training, the development of cocoa tree nurseries and agroforestry schemes, the support to biotechnology development, certifications and market interconnection, amongst other subjects.

Country	Cameroon 
Initiative	**Common project of the IRAD (Agricultural Research Institute for Development) and FODECC in Cameroon**
Donor	FODECC: 2,889,732 CFA francs MINRESI: 981,300,000 CFA francs
Context and goal	The overall objectives of the project are to improve producers' standards of living and income, to increase the quantity and the quality of cocoa and coffee production and to improve the certification of the cocoa and coffee produced. More specifically, this project intends to increase the quantity of enhanced cocoa and coffee seeds.
Development and prospects	The project aims at reinforcing the infrastructure used for the production of basic seeds, fostering certification initiatives and identifying high potential production basins. Phase 1 from 2008 to 2012: restoration of the IRAD's seed fields. Phase 2: extension/creation of new fields, UTZ certification for many groves. Phase 3 is in the process of being identified but will probably be based on the following priorities: creation of seed fields, creation of new varieties more suited to climate change and more productive. The project's main strategy is to manage to create varieties which are more suited to climate change and to future weather patterns. According to the people we met, agroforestry is for the moment the quickest strategy to implement because of the services provided by the trees (shade, humidity, soil fertilisation), given that the creation of new varieties can take up to several decades. In seed fields implemented within cooperatives, the following species are observed: • Cocoa, coffee • Fruit trees • Tree species providing temporary shade • Tree species providing definitive shade

It is also important to mention the collaboration between Barry Callebaut and GIZ with regards to the Taï forest in Côte d'Ivoire, in relation to the PROFIAB 2 programme.
In Cameroon, the PAMFOR project financed by the European Union and managed by the CTFC (Tropical Forest Technical Centre) was also mentioned to us but we were unable to obtain any details on it.

Lastly, it is important to mention a general reflection undertaken by Patrick Jagoret (CIRAD) on a multi-country project aimed at sharing the Cameroon experience of shaded cacao cultivation with a structured and multi-stakeholder approach – with the involvement of national research institutions as well as the forestry and cocoa private sectors.

3.2 - LOCAL INITIATIVES CONDUCTED BY LOGGING COMPAGNIES

The objective of this paragraph is to present some initiatives and projects discussed with logging companies we met during the mission.

Country	Gabon 
Initiative	**CEB-Precious Wood cacao plantations**
Context and goal	The aim of the project initially launched in 2010 was the planting of cacao/banana crops (simple model) in three villages surrounding the concession, with a view to developing income-generating projects contributing to the reduction of fauna and flora degradation caused by hunting, poaching or illegal sawing and responding to the requirements of the FSC certification. The project falls within the scope of article 251 (mechanisms for the redistribution of the forest rent to the populations).
Development and prospects	Launch in 2010. In 2016, the project was considered to be partly a failure: 2 plantations were abandoned and burnt down for different reasons (lack of experience of cacao crop maintenance, lack of knowledge of harvesting and post-harvesting techniques, lack of information on cash crops previously cultivated in the province, conception of the project with a 'Top/Down' approach and very little collaboration) The first harvest was nonetheless carried out in 2016 which demonstrated the technical feasibility. Resumption of the project in 2017 with an extension of surface areas, formalised support from the CAISTAB and stronger technical support from the CEB, creation of a producer association.

Country	Cameroon 
Initiative	**Agroforestry project of Ayous plantation (ALPICAM)**
Context and goal	The aim of the company was to fight against the uncontrolled and illegal development of cacao crops and of slash-and-burn farming methods together with Ayous plantations' farmers in degraded forest areas and in agricultural areas in combination with plantain farming, which is a source of employment and alternative income.
Development and prospects	Creation of a nursery and development of plant cutting and Ayous seedling production techniques. Planting and technical validation of the first steps (soil preparation, planting, first maintenance operations) The company decided to discontinue the project because of an economic difficulty.

Country	Cameroon 
Initiative	**Enrichment planting of natural forests (PALLISCO).**
Context and goal	Planting of varied native species in logging gaps, in some timber yards and in degraded areas or in forests, savannahs and Ayous plantations in forested or agricultural areas in combination with plantain trees. Technical support from the University of Gembloux/Nature +. The planting is carried out in order to respond to one of Cameroon's legal obligations and/or with a view to conducting reforestation with an ecological purpose of restoration as per the FSC requirement. There is no economic-oriented approach or search for profitability.
Development and prospects	These activities have been conducted over the past 5 to 10 years by many certified companies in Cameroon, Gabon and the Republic of Congo. Good knowledge of nursery techniques. Good knowledge of planting techniques and of the first maintenance operations.

Country	Cote d'Ivoire
Initiatives	**Forest plantations in classified forests**[4]
Context and goal	Logging companies holding a "Forest Exploitation Perimeter" (PEF) are obliged by law to engage in reforestation activities: harvesting 250 m3 of timber needs to be compensated by the reforestation of 1 ha of forest. Initially, reforesting was carried out in the rural domain ("domaine rural") but today it is carried out in the permanent forest estate and it is retroceded to the SODEFOR after one year.
Development and prospects	The SODEFOR does not have the resources available to follow up and maintain and even to control classified forests, which ruins any prospects and takes away all the benefits of this process. Good command of nursery, transport and planting techniques (cedrela, albizia and gmelina, frake/framire).

3.3 - INITIATIVES LED BY CHOCOLATE COMPANIES

3.3.1 - Chocolate companies have made many commitments on a global level

In the past few years, many cocoa industry stakeholders (bean traders, cocoa grinders and chocolate manufacturers) have launched internal programmes aimed at sustainability with a recent effort towards coordination.

Inset 1: Sustainability initiatives and policies implemented by chocolate companies (Hütz-Adams et al., 2016)

'Chocolate companies' most significant sustainability programmes include:

- Mondelez's 'Cocoa Life' initiative, launched in 2012 with a budget of USD 400 million over a ten-year period, which targets 200,000 cocoa producers and 1 million people and their communities in six cocoa production regions (Côte d'Ivoire, Ghana, Indonesia, India, the Dominican Republic and Brazil);
- Nestlé's 'Cocoa Plan' with an investment of CHF 110 million for the 2010 to 2019 period which, in addition to Western Africa, Indonesia, Ecuador and Venezuela, also covers Brazil and Mexico. The objective is to look for suppliers of 175,000 tons of cocoa through the Cocoa Plan;
- Mars and its 'Vision for change' which is progressively developing its projects, step by step, in order to reach 150,000 cocoa farmers;
- Lindt & Sprüngli which has combined its efforts within the Lindt Cocoa Foundation and works with 48,000 cocoa farmers. The company wishes to extend its programmes;
- Barry Callebaut's 'Cocoa Horizons' initiative launched in 2012 for a ten-year period and since then transformed into a foundation. The company spends CHF 40 million and uses the funds of partners and other donors. The programme under its authority targets at least 100,000 cocoa farmers;

4. Please refer to the following study conducted simultaneously by the ATIBT: 'Capitalising on learning outcomes from the experience of timber plantations in Côte d'Ivoire', FRMi, May 2018

• Cargill's 'Cocoa Promise' which reaches at least 116,000 cocoa farmers through different projects;
• Olam and its 'Olam Livelihood' charter which oversees the projects and works of at least 109,000 cocoa farmers.

Moreover, many other companies, which are part of the value chain, finance various projects in cocoa producing countries.

Most of these projects were launched with a view to increasing cocoa yields and bean quality in order to improve planters' income and secure cocoa supplies. More recently, some companies have adopted a more global approach and include in their projects elements aiming at community development by reducing child labour, improving women's conditions, encouraging young planters to keep growing cocoa, supporting producers associations or helping planters diversify their sources of income.'

he organisations that implement official development assistance also operate in the cocoa industry, sometimes with a Public-Private Partnership (PPP) approach. These organisations include but are not limited to: the GIZ, which works on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) and the German Federal Ministry for Food and Agriculture (BMEL), the Swiss State Secretariat for Economic Affairs (SECO), the Sustainable Trade Initiative (IDH), the United States Agency for International Development (USAID) as well as the United States Department of Agriculture (USDA). Most of the companies, foundations and donors do not directly deal with operational aspects and entrust these to NGOs, in particular those which are already deeply rooted within cacao farming communities, i.e. Swisscontact, Technoserve, CARE, Solidaridad.

The start of a coordination between different stakeholders. In order to align approaches on specific subjects, cocoa industry stakeholders are starting to coordinate their actions. For instance, the 'International Cocoa Initiative' aims at harmonising approaches in terms of childhood protection. Created by companies, the World Cocoa Foundation (WCF) is trying to coordinate its members' pilot projects and to harmonise the follow-up and assessment of existing projects but is encountering many difficulties (Hütz-Adams et al., 2016). Its members and producer countries have therefore launched Cocoa Action in order to adopt a regional approach of challenges and impact assessments.

The Cocoa and Forests Initiative (CFI). This is a joint action conducted by the WCF, the IDH and the Prince of Wales' International Sustainability Unit (ISU) aimed at mobilising cocoa and chocolate stakeholders, public institutions and NGOs so that they commit to end the deforestation and land degradation caused by the chocolate industry, whilst improving farmers' standards of living. On the1st of December 2017, the governments of Côte d'Ivoire and Ghana together with 22 companies signed joint 'Frameworks for Action' which were officially presented at the COP23 United Nations Climate Change Conference. The commitment of ending the conversion of

forest areas into cacao crops was at the heart of these Frameworks for Action.

Interests are converging in Côte d'Ivoire. As we will examine later, in the Republic of Côte d'Ivoire, the convergence of interests between chocolate companies and logging companies already leads to some concrete partnerships in the field, for example between the Ministry for Water and Forests, the Tranchivoire timber company and the Barry Callebaut chocolate company or between Cemoi, partner cooperatives and Tranchivoire.

3.3.2 - Focus on two chocolate company initiatives in Côte d'Ivoire

Country	Côte d'Ivoire
Initiatives	**Agroforestry Pilot Project**
Partners	SACO, Ivorian subsidiary of Barry-Callebaut Tranchivoire Ministry for Water and Forests Cocoa planters
Context and goal	The project aims at adapting to the effects of climate change, improving incomes and achieving sustainable cocoa production without deforestation. Concretely, the project intends specifically to manage cacao plantations in a sustainable way and to ensure the viability of reforestation operations within Tranchivoire's **Forest Exploitation Perimeters** (PEFs) in the regions of Agné-by-Tiassa, Mé and South-Comoé. In order to do so, an agroforestry system has been developed which integrates reforestation in timber species associated with legume and cacao crops. It was decided to implement a spacing between the lines so that tractors can access the lines in the long run for collection and mechanical harvesting operations. The 4th line is dedicated to timber species, which enables to have an economically sustainable density of timber species, whilst reducing cocoa density to 883 trees/ha: • 833 new trees per ha of 'Mercedes' cocoa, • 139 timber tree species per ha (Niangon, Mahogany, Cedrela, Teak, Framire, Frake, Samba/Ayous). • The Gliricidia sepium species can be used with a density of 417 trees/ha intercropped with timber species to quickly obtain the necessary shade for cacao tree recovery and improve fertility. This species will provide firewood to the planters. • At the beginning of the planting, intercropping crops with plantains (417 plantain trees) and maize. Cacao trees and other species of trees are maintained and pruned (with special attention paid to the pruning of tree crowns) so that they don't hinder one another. This technique was already experimented with by Barry Callebaut.
Development and prospects	The pilot project was launched in the departments of Agboville, Yamoussoukro and Sinfra. The project aims at contributing to the restoration of the forest cover at the rate of 200 ha of land per year and at increasing the income of the people living in the project area.

Country	Côte d'Ivoire
Initiatives	**Transparence Cacao**
Partners	Cemoi, in partnership with cooperatives, the CCC (Coffee and Cocoa Council) and other donors mobilised by CEMOI: IDH, GIZ, AFD (C2D Cocoa Friend of the Forest).
Context and goal	Cemoi is a large chocolate company with expertise throughout the entire cocoa and chocolate chain. Transparence Cacao is first of all a traceability programme, but it also aims at quality management and respecting the environment. The Transparence Cacao programme chose Côte d'Ivoire as a pilot area because it is the world's first producer country and it is faced with grove degradation and deforestation. This policy is based on four main priorities: chocolate traceability, aromatic quality, planters' standards of living and environmental protection.
Development and prospects	2017: modelling of techniques; 2018: validation and start of pilot projects (9 plots per cooperative out of 30 cooperatives). Three main association models will officially be proposed to the CCC. There will be over 250 demonstration plots within the scope of the Transparence Cacao programme.

The experts within the Cemoi programme that we met consider several strategies in order to promote the cacao crop and timber species combination:

• Support from the cooperatives for the introduction of trees in **cacao crops that are already in place**, with certification programmes as a motivation driver. In the certification programmes, 18 trees/ha from 3 to 5 species are required. Historically, the certification programmes have spurred the introduction of more trees. The cooperatives took the initiative of distributing seedlings to producers. The farmers planted trees in light gaps in their groves.

• Support by private structures:
- Chocolate companies, always within the scope of certification. The associated trees are mainly frake, framire, niangon (Heritiera densiflora), sometimes Gliricidia sepium, which are easy to propagate.
- Timber industry stakeholders in the context of mandatory compensatory reforestation projects. The planting carried out in the rural domain ("domaine rural") is often a failure because of farmers' lack of involvement. This explains the implementation of **three-party agreements** like the one organised between Tranchivoire, Cemoi and the cooperatives. The model promoted is based on 100 trees/ha with a 30% mortality rate which results in a ratio of 70 trees/ha in the long run. The timber industry stakeholder provides the seedlings, carries out the installation and the maintenance over a two-year period on a pro bono basis. During this two-year period, the farmers are trained in cacao crop management (pruning of cacao trees, trimming of trees etc.). This project **started in 2017**. The trees belong to the farmers but the agreement states that Tranchivoire has priority for the acquisition of trees and Cemoi has priority for the purchase of beans.

3.4 - TECHNICAL APPROACH IN SOME AGROFORESTRY SYSTEMS ALREADY IMPLEMENTED

The objective of this section is to summarise the different «models» of shaded cacao plantations we have read about or heard of in interviews with consultants.

Table 3: Some cacao agroforestry models read about or heard of in interviews

Densities	Country	Cacao/ha	Food and fruit trees/ha	Intermediate trees/ha (<18 m or fertiliser trees)	Large trees (>18 m)/ha
Recommendations cited in literature					
Unité Technique Café Cacao (UTCC) (Coffee and Cocoa Technical Unit)	Togo	1 320	1,320 plantain trees	15 72 (10mx10m) at start 36 (quincunx) at 4-8 years Final density: 15 Species: Albizia adianthifolia, Albizia zygia, Samanea saman	8-10 28 (10mx10m) at start 14 (quincunx) at 4-8 years Final density: 8-10 Species: Terminalia superba (Limba), Khaya grandifoliola (Mahogany)
Coffee and Cocoa Council (CCC), World Cacao Foundation, IDH	Côte-d'Ivoire	3 m x 2,5 m	3 x 5 m Wild mango, plantain trees, guava tree, akpi	Legume at 3 x 5 m which is gradually eliminated to obtain 20 to 30 plants/ha	18 to 20/ha max use 5 to 10 different species examples: Acacia, Albizia, Alstonia, Coconut, Dacryodes edulis, palm tree, tiama, rubber tree, gliricidia, hevea, framire, limba, makoré.
CIRAD/IRAD (Bourgoing and Todem, 2010)	Cameroon	972	1,180 plantain trees 40 avocado trees 81 citrus fruit trees	40 Dacryodes edulis trees	
World Bank Congo (for REDD+ area)	Congo	950	950 plantain trees 35 citrus fruits 35 avocado trees	35 Dacryodes edulis trees	123
Cocoabod (cited by Asare R., 2016)	Ghana				18 (24m x 24m) 30 to 40% shade
Rainforest Alliance	World		Unquantified examples: Orange trees, mango trees, avocado trees, rambutan, mangosteen.		12-18 max

ISTOM and GIZ (work by Rossignol A., 2014)	Cameroon	1,000 to 1,200 (CIRAD, 2014) 3m x 3m	1,666 (CNRA) plantain trees 3m x 2m		125 ayous 9 x 9m
Ministry of Water and Forests, T ranchivoire and Barry Callebaut	Côte-d'Ivoire	833 4.5 m x 2 m + 417 food crops: spaces between lines	417 plantain trees 4.5 m x 5 m	417 gliricidias 4.5 m x 5 m	139 13.5 m x 6 m
World Agroforestry Center		1 111		35 Dacryodes edulis trees 26 wild mango trees	47 njansangs
Alemagi et al. 2015	Cameroon		12 x 12 m Persea americana, Dacryodes edulis Mangifera Indica, Cotus snensis, etc.	6 m x 6 m	
Recommendations given orally					
IITA / Cameroon	Cameroon	1000	100		25 (planting of 50 to obtain 25 in 7 years)
Jean Michel Harmand and Alain Tsobeng (CIRAD)	Cameroon	1000	30-40		10
Christophe Kouamé (oral communication in 2014)	Côte d'Ivoire	900 (clones, to obtain 1t/ha min.)			10 iroko/frake or more because grows high so little impact on the cocoa tree
NGO Impactum	Côte d'Ivoire	1200			100 (firewood species, timber, medicinal species)
Cemoi, Tranchivoire, Cooperative tripartite projects	Côte d'Ivoire	1200			70 100 trees at the start, and 70 in the long term (niangon or Erithera densiflora, Khaya anthotheca, frake, framire)
RCI	Cameroon	1300			16
Didier Hubert, REDD+ advisor	Cameroon		Plantain trees		Recommended species, with a spacing of 10 m x 10 m: Guarea cedrata, sapelli, utile, kosipo, tiama, guibourtia, moabi

4. ANALYSES FROM THE TWO MISSIONS IN CAMEROON AND CÔTE D'IVOIRE

4.1 - STRENGTHS AND WEAKNESSES OF A CACAO DEVELOPMENT PROJECT SHADED UNDER TIMBER TREE SPECIES

Different models of cacao plantations shaded by forest plantations were discussed and are presented in detail (including a technical and economic analysis) in part 4.3 of this report.

Essentially, a «cacao/forestry plantation project» will always be based on an organisational, technical and economic exchange and agreement scheme between the farmer (who will plant the cocoa and trees and maintain the agroforestry system), the cocoa buyer (industrialists, merchants, trading cooperatives, etc.) and the end buyer of the standing timber (the logging company). These organisational and financing schemes must be established or invented according to the size of the project (geographical scope, necessarily long-term), the natural context, legal constraints, the socio-cultural situation, etc.

The purpose of this paragraph is to present an analysis of the strengths, weaknesses, opportunities and threats for the development of theoretical cacao-timber trees agroforestry schemes based on growing cocoa plants under the shade of a timber plantation. This analysis is based on discussions and analyses carried out with the various persons interviewed, whether they be producers (farmers and planters), beneficiaries of agroforestry system products (logging companies or chocolate companies) or stakeholders (administrations, NGOs, institutions and donors).

ADVANTAGES

- Both countries have strong technical experience and skills in shaded cacao farming with producers who have technical skills both in production and sales (highly developed cooperative system in Côte d'Ivoire and Cameroon)
- This experience and culture is supported by many research centres and organisations specialised in technical support as well as cacao tree

WEAKNESSES

- The project is based on a number of unknown technical factors: For the native species, there is a lack of planting experience (no/little experience with native species in CI, plantations mainly for ecological restoration in forest concessions in Cameroon). Indeed, there are few or no references to the volumes of wood expected at the end of the rotation (much unknown about low-density planta-

ADVANTAGES

nurseries. These organisations have human and financial resources and are recognised.

• On the ground, there is a real cooperative culture and cooperative knowledge.

• The project answers a need expressed by the main beneficiaries (chocolate and logging companies).

• The cocoa/forestry plantation project encompasses a multitude of topics and considerations regarding the Congo Basin (economic and ecological sustainability of forest concessions, schemes to combat deforestation and the REDD system, payment tools for environmental services, etc.). In fact, this is a technical approach that may be of interest to many donors.

• In Côte d'Ivoire, there is also a good level of technical expertise in terms of the management of nurseries and plantations.

WEAKNESSES

tion growth), wood quality (plantation trees do not have the same mechanical qualities as trees from natural forests) and harvesting methods (in particular about possible crop damage when harvested (volume and final wood quality, tree harvesting methods, damage to cacao trees).

• Due to the technical uncertainties, it is difficult to establish economic approaches (plantation yields and productivity, standing timber value, cocoa production, etc.)

• Cacao crops and agroforestry lie outside logging companies' core business, which will mean training is needed, as well as increased skills in monitoring and evaluation of projects and investments. Moreover, this movement away from the core business can result in a lack of availability and time or involvement.

• The project will not directly affect many ATIBT members apart from the few innovative companies, driving forces or those that want to diversify their services and resources. FSC-certified companies that are required to carry out income-generating local development projects will also be interested in this type of project. However, there is a risk that the concept of cacao agroforestry under forest plantation may be of little interest in the Congo Basin forest concessions. Concessionaires seem to be quite resistant to change. Nevertheless, their involvement will probably be greater if they are strongly supported by the chocolate manufacturers and if they play a supporting or endorsement role in the project (access to land and infrastructure, relations with their concession's local communities, facilitation, logistical support etc.)

• A project that will take time and which involves many prerequisites: law adaptation, implementation of experiments, training, awareness-raising for farmers)

• Chocolate companies already have their internal sustainability policies in place, would they be willing to pay producers a higher price for agroforestry cocoa?

OPPORTUNITIES

• Côte d'Ivoire is facing a climate emergency with the risk of cocoa systems in full sunlight disappearing (sensitivity to drought). There is also a plan to accelerate the renewal of plantations that are outdated or affected by the Cocoa Swollen Shoot Virus Disease. This emergency situation is forcing chocolate producers and manufacturers to find concrete alternatives or adaptation solutions. Cocoa systems under forest plantations is one of these solutions

• Administrations are aware of the difficulties linked to the legal corpus (see threats) and discussions on forest codes are currently underway in both Côte d'Ivoire and Cameroon. In addition, there are already ongoing discussions about listed agroforests in Côte d'Ivoire and about an «agroforestry concession» title in Cameroon

• There seems to be an increasing demand from consumers for sustainable and environmentally and socially responsibly produced cocoa. There is therefore a potential growth market for «agroforestry cocoa from positive reforestation» which is possibly certified.

• There is a clear issue of timber scarcity in Côte d'Ivoire, so all opportunities to increase timber resources in the medium term (15/20 years for fast-growing species) are interesting.

• Fairly generalised consideration of the forest concession model (concession 2.0 in CIRAD, 2nd generation silviculture in Cameroon)

THREATS

• In both countries, the legal corpus is not fully adapted and does not mention agroforestry

• The status of the tree and its ownership is a difficulty for any implementation of agroforestry projects. The owner of the land rights or the usage rights is not necessarily the owner of the tree. Up until 2014 in the RCI if the tree was included in a PFE, the operator who owned the PFE had the right to exploit it. Since the 2014 law, the tree belongs to the planter holding the deed, but in practice the tools to apply the law have not yet been finalised. Obtaining land deeds is an extremely long and complicated process (several dozen documents). In Cameroon, a farmer can use a tree for his own consumption (carpentry, construction) with permission. He cannot sell it. In the non-forest estate, the farmer has the tree property and usage rights provided that he can demonstrate that he planted it himself (often complicated).

• On the other hand, culturally, a cacao plantation gives «land rights» which causes problems/conflicts when it comes to «illegal» population planting. There is a social/political problem of legalisation (the situation is more or less comparable in Côte d'Ivoire and in some areas of south-eastern Cameroon bordering the Central African Republic.

• The availability of land for the implementation of agroforestry projects is not simple in Cameroon. It is not possible to develop agricultural activities in the permanent forest estate (i.e. in forest concessions) with the exception of those with agroforestry parts (few cases in Cameroon, a little more frequent in Congo or Gabon). Moreover, there is no possibility for a logging company to plant or produce crops (unless he applies for a specific professional accreditation)

• Risk linked to social and cultural acceptance by farmers who have received the opposite message for decades (growing cacao plantations in full sunlight for better yields, cutting down trees that compete with cacao trees and/or are disease vectors).

This analysis shows that despite the technical and economic unknowns of a cocoa/forestry plantation model and the lack of visibility as concerns legal aspects, there are many advantages to setting up such a system. It is a win-win strategy for both chocolate manufacturers and logging companies which favour creation of a resource available in the short term (quality cocoa production) and in the medium to long term (availability of timber based on the selected forest species that grow at different speeds). The social benefits (development of income-generating activities, employment etc.) and environmental benefits specific to agroforestry systems are obvious. In a way, this scheme would also enable more direct capture of forest rent by producers (farmers and planters) at the time of standing timber sales.

4.2 - PERCEPTIONS OF INVOLVED PARTIES AND CONSTRAINTS OF EACH STAKEHOLDER

The purpose of this paragraph is to detail some specific points of the SWOT analysis below, but also to highlight some specific interests or issues for the main parties involved.

4.2.1 - Logging companies

The main interest for Ivorian logging companies is to **effectively contribute to helping with the recovery of an increasingly rare wood resource.** For them, any project that makes it possible to create permanent, productive, maintained and sustainable forest plantations (for which there is hope of a harvest period) is a good initiative. This is obviously a long-term vision (15/20 years minimum) that does not fit into the current system of farms organised in the PEFs, which is similar to very short-term harvesting.

Logging companies in Cameroon (or in other countries in the Congo Basin) envision this type of initiative on a smaller, local scale, in their concession (at least in agroforestry areas) with the objective of setting up a local, income-generating development project that fits well with the FSC **certification** requirements. It is more about maintaining a good relationship with neighbouring communities and providing alternatives to hunting or poaching. In this type of project, an economic approach and profitability are not priorities.

Logging companies (in both countries) are also interested in seeing how involvement in other activities (agroforestry in this case) can be an **opportunity to diversify** activities and sources of income within the forest concession. The economic model based on farming a limited number of native species seems to be increasingly challenged by the scientific community (Alain Karsenty of CIRAD in particular). It is becoming increasingly clear that it will be necessary to generate alternative environmentally and socially responsible revenue to ensure the sustainability of concessions. Cacao/forest plantation agroforestry should be considered alongside other op-

tions envisaged such as agribusiness, tourism, payment for environmental services, conservation, carbon, etc. Finally, another common interest for both countries is that by planting forest species, logging companies could help meet compensatory reforestation obligations (reforestation set at 50 ha/year/concessionaire in Cameroon and on the basis of an annually calculated quota in Côte d'Ivoire).

In interviews with some companies, the question was raised about the compliance of agroforestry with forest certification.
This analysis shows that special attention should be paid by certified companies depending on their level of responsibility for the integration of a project and the geographical location of the plantations.

• Any agroforestry activity should be considered as an agricultural activity and if it takes place in the permanent forest estate it is contrary to legal provisions (certificate of legality and principle 1 of the FSC). In addition, it would also concern criteria 6.9 and 6.10 of the FSC linked to the non-conversion of natural forests (over a surface area of over 5% of the concession or in proportions greater than 0.5% of the FMU surface/year).

• In savannah areas or in areas that are already farmed or highly damaged, the concessionaire could take responsibility for participating in/encouraging cacao/plantation projects, but it would be necessary to carry out a preliminary analysis (approved by the administration and the main stakeholders) to ascertain the extent of the critical damage to the forest cover.

• The use of chemicals to treat the trees could also lead to non-compliance risks as a large proportion of the products used are included in the FSC List of "highly hazardous" pesticides (FSC-STD-30-001a EN), such as 2,4-D to treat cocoa swollen shoot virus disease, imidacloprid lamndacyhalotrine against cocoa mirids (distantiella theobroma), and chlorpyryfos-ethyl against cocoa pod borers (tragocephapa sp), not to mention the range of herbicides that are also used to control grass coverage.

4.2.2 - Chocolate companies

The main interest of chocolate companies is to ensure long-term yields (taking into account the risks of ageing plantations and global warming) so as to have sustainable access to cocoa beans («availability»). These beans must meet other standards such as traceability, social and environmental sustainability and the «zero deforestation» criterion.

4.2.3 - Farmers

By growing cocoa, farmers are mainly looking for a fairly profitable and stable income. Environmental certification (Rainforest-UTZ for example) is also of interest to them because it allows them to access valuable sustainability bonuses. For the farmer, agroforestry makes it possible to improve/ensure his yield in the long term. Finally, species associated with cacao trees provide timber, fuelwood and non-wood forest products useful for healing, eating (fruit) and diversifying income (e. g. moabi, akpi, etc.).

4.2.4 - States

The cacao/forestry plantation strategy has always been welcomed by administration and institution representatives met. It is indeed a process that is part of the value chain approach that makes it possible to reduce/combat deforestation, while promoting an economic model that generates wealth and development at a very local level (income and food security).

Table 4: Assistance and Synergy Matrix

Acteurs	Raison d'être	Préoccupations	Difficultés propres / risques	Interaction possible avec les autres
States	• Agricultural and forestry development	• Securing tax revenues • Combating illegal activity • Good governance	• Resources, skills, socio-political stability	• Establishment of public policy, tax incentive schemes, production, update and implementation of forest, agricultural and environmental legislation.
Logging companies	• Production of timber	• To be able to respond to social development requirements related to certification • Guaranteed return on plantation investment • Diversify income	• Managing activities which they don't have the skills for • Illegal activities due to the presence of local populations.	• Cooperation envisaged with chocolate companies
Chocolate companies	• Cocoa production	• Access to zero deforestation, or positive action for forest • Ensure the sustainability of supplies	• Traceability of legal cocoa products • Have quality products that meet certification standards • Climate change	• Cooperation planned with the wood companies
Local farmers	• Agricultural production	• Food security • Sufficient and stable income • Human development (health, education, savings)	• Access to land and security of access • Tree ownership • Hazards (climate, prices, yields) • Motivating young people	• Integrate income-generating and sustainable value chains (cocoa, fruit, NTFPs, wood)
Research	• Generate knowledge	• Uncertainties related to climate change	• Partial knowledge of cocoa/timber • Have enough resources over the long term	• Implementation and follow-up of experimental cocoa under the shade of timber species

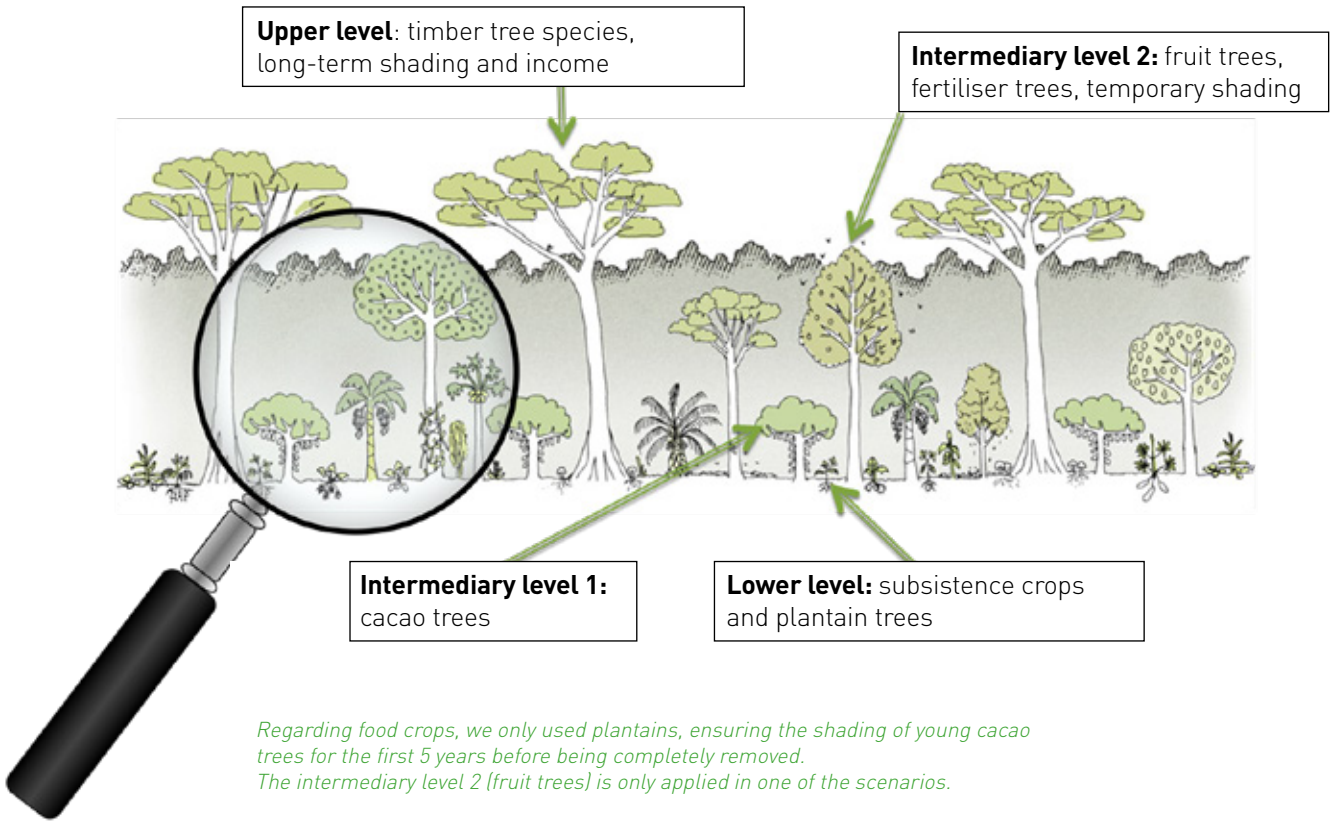
Technical operators, extension workers	• Provide technical support for agroforestry	• The ability of farmers to employ methods	• Financing of operations	• Training and monitoring of farmers
Microfinance institutions	• Facilitate the financing of income-generating activities	• Ability to develop activities in the field • Financial risk	• Solvency of farmers involved in the microfinance process	• Development of upstream financing solutions
Environmental NGOs	• Preservation/ conservation of biodiversity	• Deforestation associated with agricultural activity	• Financing of operations	• Training and monitoring of farmers • Impact assessment
Development NGO	• Representation and defence of local populations and indigenous peoples • Development support	• Fair share of income from agroforestry activity	• Financing of operations	• Training and monitoring of farmers • Impact assessment
Donors/ echnical service providers	• Financing and development technical advisers (agriculture, forestry, social)	• Effectiveness and lasting impact of projects • Combining forest and development	• Allocating funding to effective projects • Not always easy to finance integrated projects	• Finance one or more aspects (nurseries, research, technical assistance, training)

4.3 - TECHNIQUE SUGGESTIONS AND DISCUSSIONS

To be able to respond to the contents of the Study Terms of Reference, the consultants designed different theoretical models of cacao plantations under forest plantations so as to (1) be able to discuss in more operational and technical detail with logging companies and chocolate companies, (2) establish the technical feasibility and working hypotheses and (3) compare their theoretical economic performance or even (4) their environmental performance. This exercise is of course only theoretical and neither technical conclusions nor requirements can be drawn from it, but rather questions or suggestions raised.

4.3.1 - Structure of shaded plantations

In this study, we used a fairly classic four-level structure:



Regarding food crops, we only used plantains, ensuring the shading of young cacao trees for the first 5 years before being completely removed.
The intermediary level 2 (fruit trees) is only applied in one of the scenarios.

4.3.2 - Consideration of specific national contexts

So as to take into account the forest contexts of the 2 countries concerned and their specificities in terms of history, experience, legal context and stakeholders' expectations, 2 main families of scenarios have been drawn up:

Cameroon scenarios	Côte d'Ivoire scenarios
Native forest species	Rapidly-growing exotic species
Varied forest species (environmental issue)	Limited number of forest species
Processing of heavy timber after longer rotations (50 years)	Possibility of commercial processing of small wood
Low cacao density	High cacao density
Full sun cacao scenario (for comparison/reference situation)	

4.3.3 - Analysis of working hypotheses and limitations of the exercise

4.3.3.1- On forestry aspects

As mentioned earlier in the SWOT analysis, a cacao plantation project under forest plantation is based on many uncertainties both technically and economically.

Data on fast-growing species (teak, eucalyptus, gmelina and to a lesser extent cedrela) is available for planting techniques, densities and growth. It is much more fragmented for agroforestry designs.

On the other hand, there is very little information on increases in plantations of native forest species, let alone low-density agroforestry plantations. It is therefore risky to claim to be able to precisely define volumes expected at the end of the rotation or volumes available at the time of thinning. No information was collected in the literature review on the effectiveness (or even biological feasibility) of pruning, on the mechanical quality of the wood (as increases in low-density plantations are greater, we should expect - if we risk drawing a parallel with temperate agroforestry, less dense, possibly more delicate, flexible and poorly shaped wood because it is less protected by the competition).

There are also uncertainties about possible interactions between creeping or shallow root systems and competition for water and soil resources. In addition, there are doubts about some combinations and in particular the ayous/cocoa combination, two species from the same family (sterculaceae, malvaceae) which could have common mycorrhizae and therefore could compete with each other rather than have a mutually beneficial effect.

These technical and silvicultural uncertainties obviously cause uncertainty about the economic valuation of the model. Today, there is no reference value for native species standing timber. There is no formal purchasing system for this type of standing timber in Cameroon either.

The operating costs of an agroforestry plantation (with available stem densities of up to 50 stems/ha) cannot be compared with natural forest operating costs (density of 1 to 2 stems/ha with high road construction costs and skidding roads). Similarly, the impact of logging and timber removal in agroforestry models is not easy to assess, but it is clear that these activities can cause damage to existing crops.

To limit this uncertainty, the proposed models systematically present cocoa renewal periods (25 years) that are consistent with thinned/cut forest rotations (25/50 years).

4.3.3.2 - On cocoa aspects

The cacao plantation **rotation period** was set at 25 years, a figure often mentioned during interviews.
Regarding cacao tree **density**, planting distances vary according to the nature of the soil, climatic conditions, cultivation methods and varieties planted. The recommended spacings are:
• 2.5 m x 2.5 m in South-Central Cameroon, i.e. 1,600 trees/ha because the soil is very desaturated and there is lower development of cacao trees;
• 3 m x 2.5 m in Côte d'Ivoire, or 1,333 trees/ha.
(Mémento de l'agronome, 2002).

In the techniques studied, the number of cacao stems/ha is inversely proportional to the amount of timber-producing trees/ha. This choice of method can be refined in

more detailed analyses, because, for example, cacao trees could be reintroduced during the thinning of timber tree species using the underplanting technique (this technique allows cacao trees of different ages to be grown in the same plot, the oldest providing shade for the youngest).

Concerning the yields of merchantable cocoa, we have drawn up graphs with the following profile:

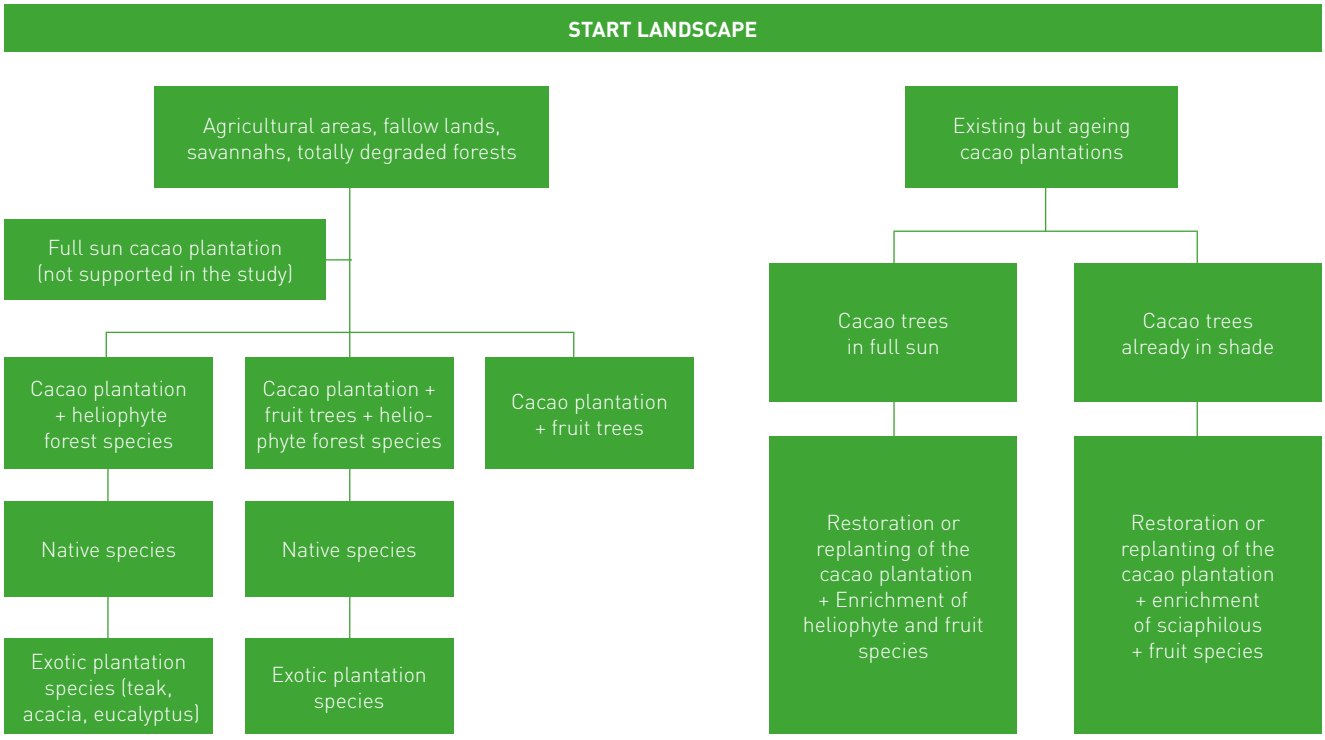
- First harvests around 3 years.
- Yield increases then reaches a plateau around 12-13 years (we have had yields of 500 kg/ha on average in Côte d'Ivoire, capped at 850 kg in year 12, 420 kg/ha on average in Cameroon with 715 kg/ha over the 2 years of peaks in performance).
- Decreasing returns afterwards.
- Renewal of the plot at 25 years and repeat of the cycle.

The prices per kg of merchantable cocoa are obtained by averaging the minimum prices guaranteed to the producer during the main season in Côte d'Ivoire (880 CFA francs/kg) and the average producer price in Cameroon (1,150 CFA francs/kg) over 5 years. There is a fairly marked difference because the two countries do not have the same pricing systems.

4.3.4 - Economic performance compared for the different techniques

Taking into account the technical and economic uncertainties presented above, this performance analysis should be considered to be a comparison of the different techniques (that is, assigning a price is used to compare scenarios and does not fix this price), their level and their dynamics, all working hypotheses and cost data being equal. Figures and absolute data are not consolidated.

The diagram below shows the diversity of the farming systems studied according to the starting landscape:

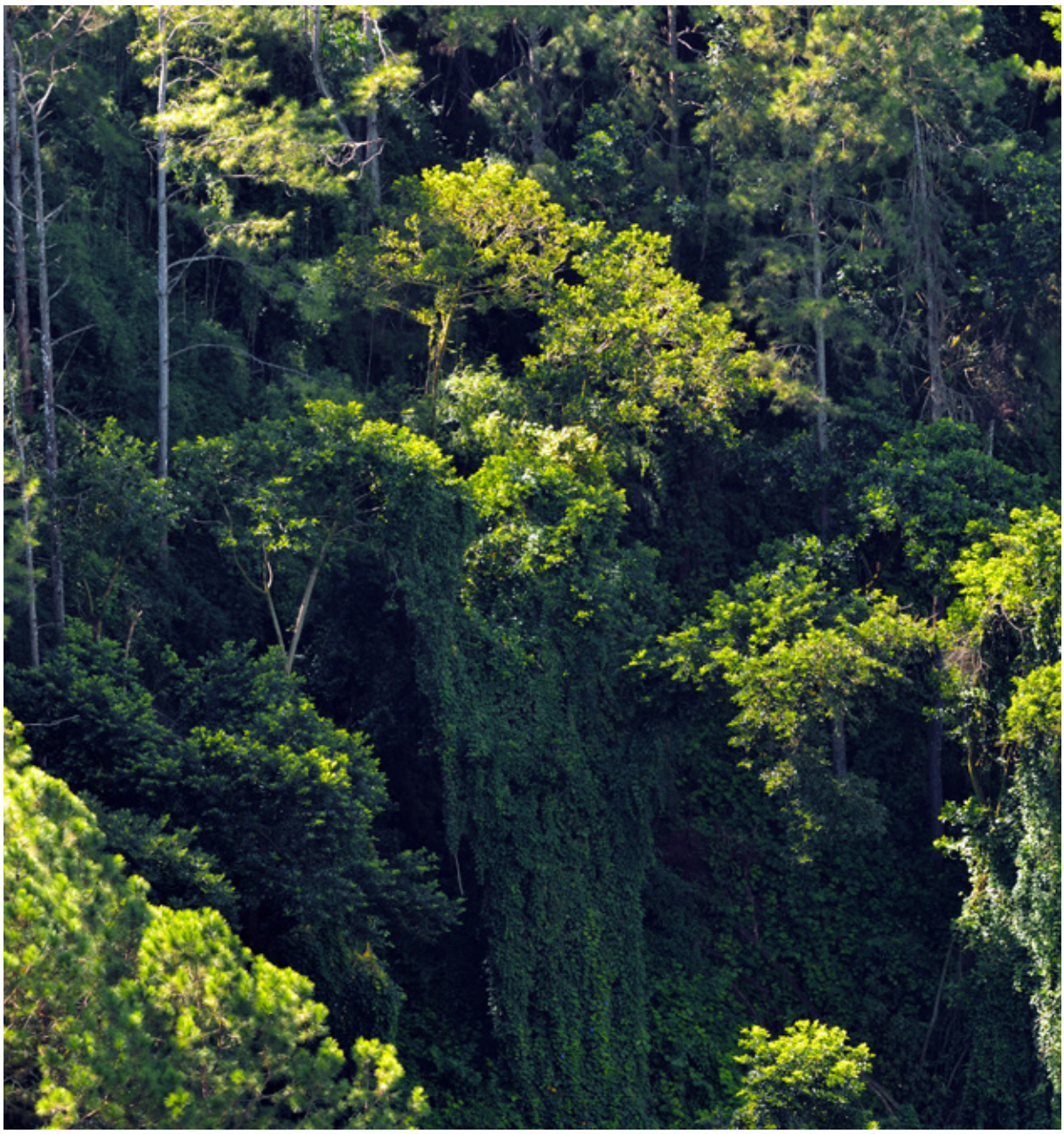


The economic interests common to these farming systems are as follows:

- The progressive management of widespread shade (30-40%) while allowing timber harvest by thinning.
- The processing of timber which makes it possible to finance, among other things, the renewal of cacao plantations at 25 years and 50 years. Indeed, several studies (eg IDH, 2016) have revealed that the inability to finance the replanting of obsolete cocoa farms could push farmers to maintain old, yet unproductive plantations.

But there are risks common to these cropping systems:

- The impact of logging that we are trying to limit by aligning thinning operations with cacao tree renewal periods.
- Uncertainties about yields, tree behaviour, final quality of wood products, possible interactions between cacao trees and other trees, impacts of agronomic methods of cocoa farming (chemical input).



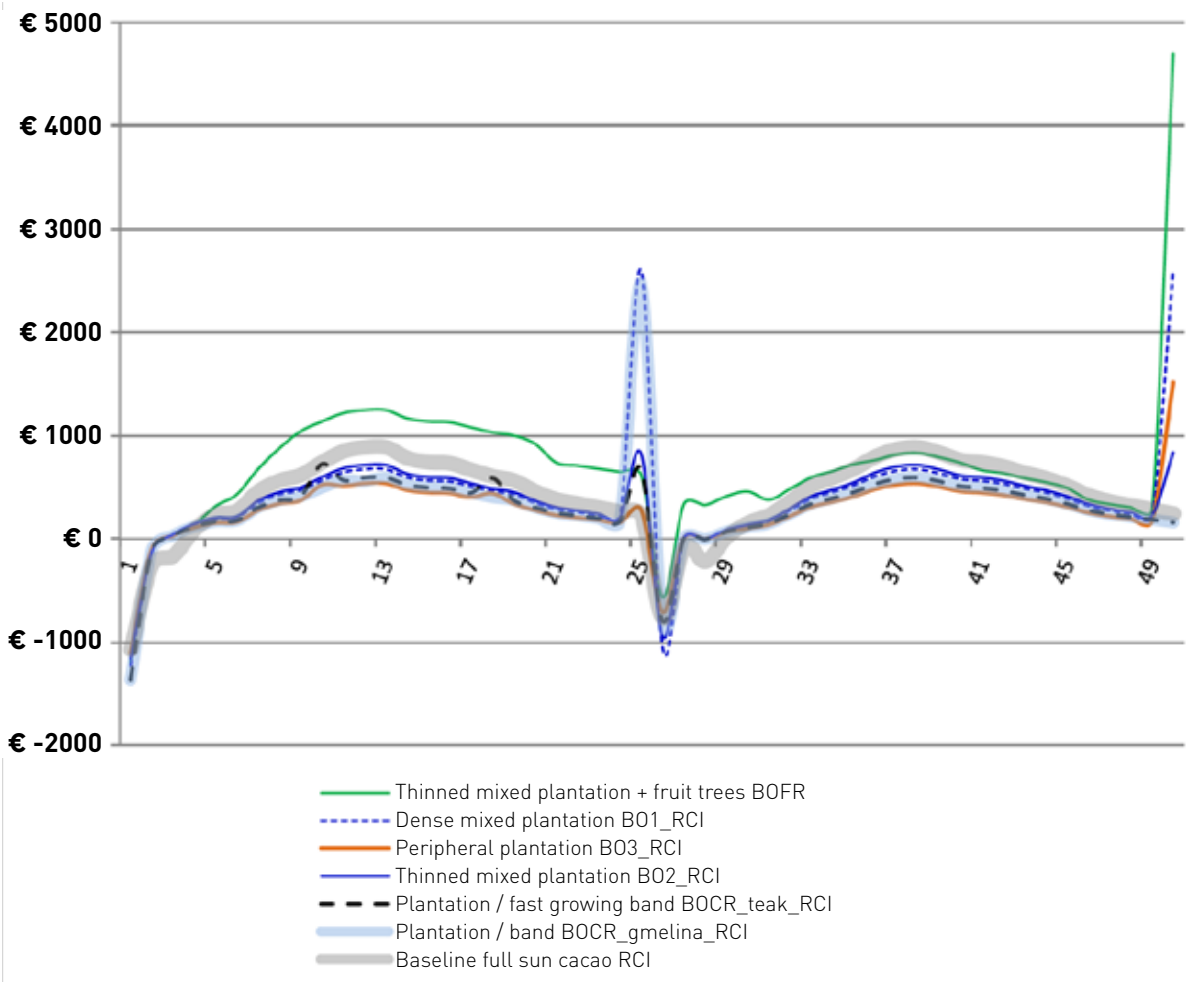
4.3.4.1 - Spécifications techniques des différents modèles étudiés

Congo Basin				Thinning 1 (EC1)			EC2			EC3			Final cut (CF)		
Characteristics	Model reference	Species	Initial density/ha	Age	No. stems	Vol. Unit (m^3)	Age	No. stems	Vol. Unit (m^3)	Age	No. stems	Vol. Unit (m^3)	Age	No. stems	Vol. Unit (m^3)
Dense mixed plantation	BO1_BassinCongo	Various species	84							25	35	1,5	50	35	3
Thinned mixed plantation	BO2_BassinCongo	Heliophyte (Ayous)	23										50	18	4
Peripheral plantation	BO3_BassinCongo	Heliophyte (Ayous)	124	10		0,4	18	20		25	20	2	50	24	4
Plantation / fast growing band	BOCR_Bassin1Congo	Exotic (teak)	198	10	50	0,2	18	30		25	20	0,8	40	48	1,8
Thinned mixed plantation + fruit trees	BOFR	Heliophytes	40		100								50	30	4
Côte d'Ivoire				**EC1**			**EC2**			**CF1**			**CF2**		
Characteristics	Model reference	Species	Initial density/ha	Age	No. stems	Vol. Unit (m^3)	Age	No. stems	Vol. Unit (m^3)	Age	No. stems	Vol. Unit (m^3)	Age	No. stems	Vol. Unit (m^3)
Dense mixed plantation	BO1_RCI	Various species	84						1	25	70	2	50	70	2
Thinned mixed plantation	BO2_RCI	Heliophytes (frake)	23							25	18	2,5	50	18	2,5
Peripheral plantation	BO3_RCI	Heliophytes (frake)	124	10	60	0,4	18	20	1	25	34	2			
Plantation / fast growing band	BOCR_teck_RCI	Exotic (teak)	198	10	100	0,2	18	40	0,4	25	58	0,8			
Plantation / band	BOCR_gmelina_RCI	Exotic (gmelina)	198	12	100	0,4				25	98	0,8			
Thinned mixed plantation + fruit trees	BOFR	Heliophytes	40										50	30	4

4.3.4.2 - Results for the models studied for Côte d'Ivoire

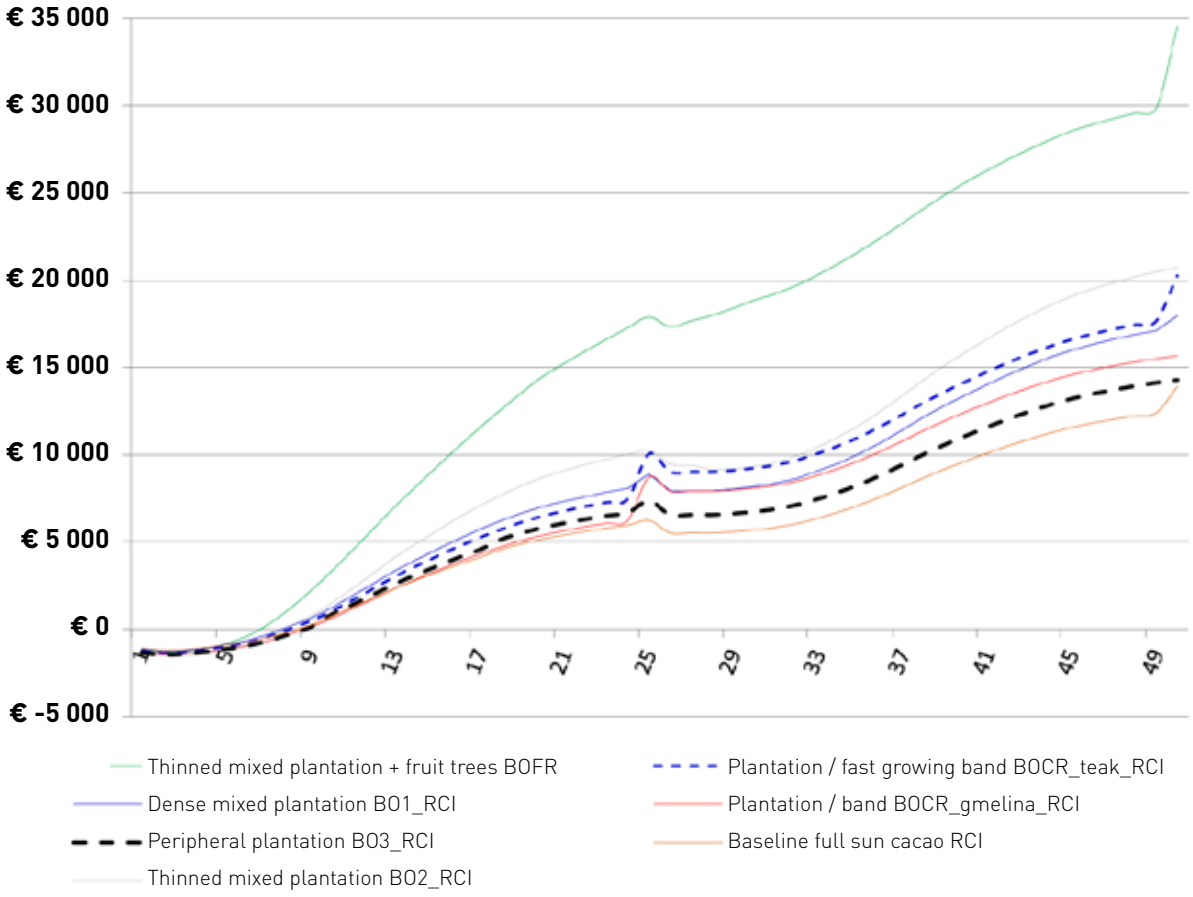
Annual income compared over 50 years

Techniques including timber make it possible to meet the costs of renewing the cocoa plot at around 25 years, potentially relieving this obstacle preventing many farmers from replacing old cacao trees.



Cumulative income compared over 50 years

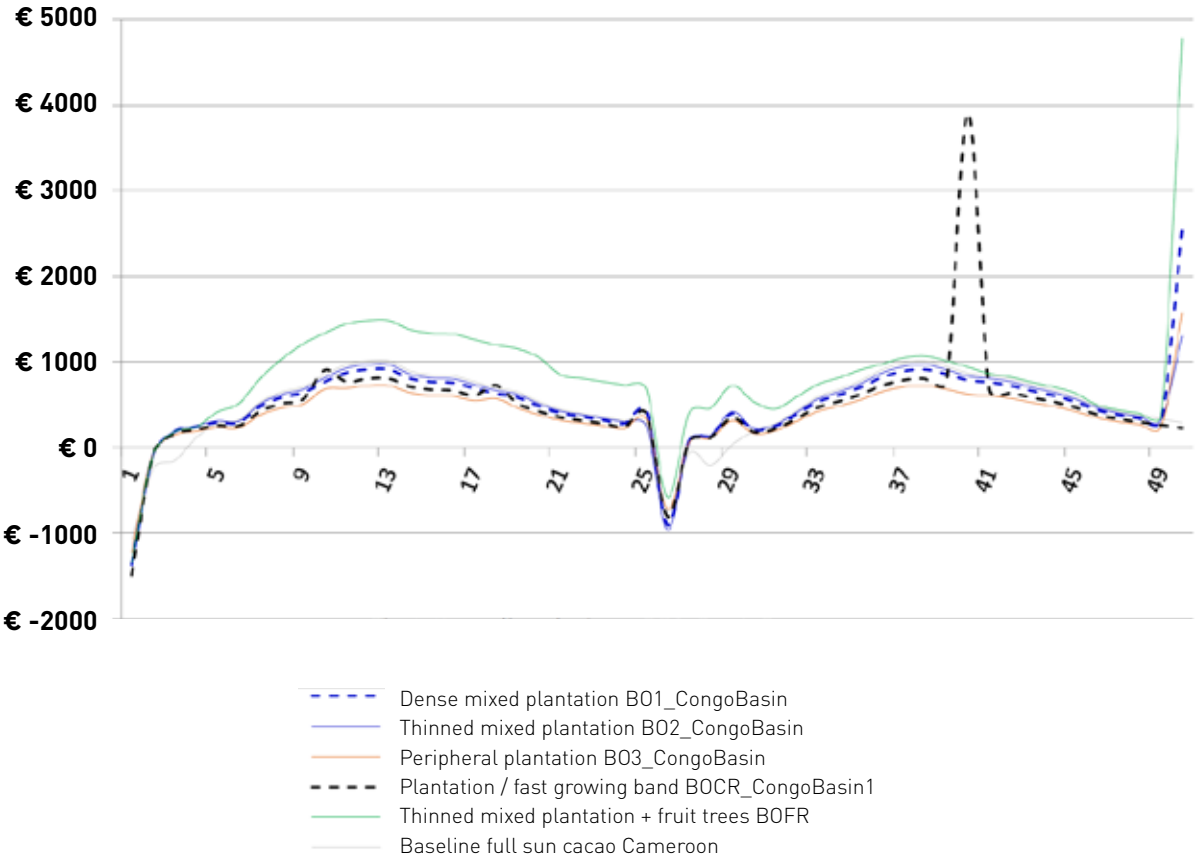
Cumulated, the reference situation (cacao in full sun) brings in significant incomes, given the higher tree density. But it is easy to understand why such techniques have many risks: sensitivity to cocoa prices, sensitivity to global warming. The system that yields the most in terms of cumulated income is that which combines cacao trees + timber species (in medium density) and fruit trees. The quantity of wood harvested is significant (13m^3/ha/year on average), with an average income per family worker of €17/working day (compared to €10/day for cacao in full sun).



4.3.4.3 - Results for the models studied for the Congo Basin

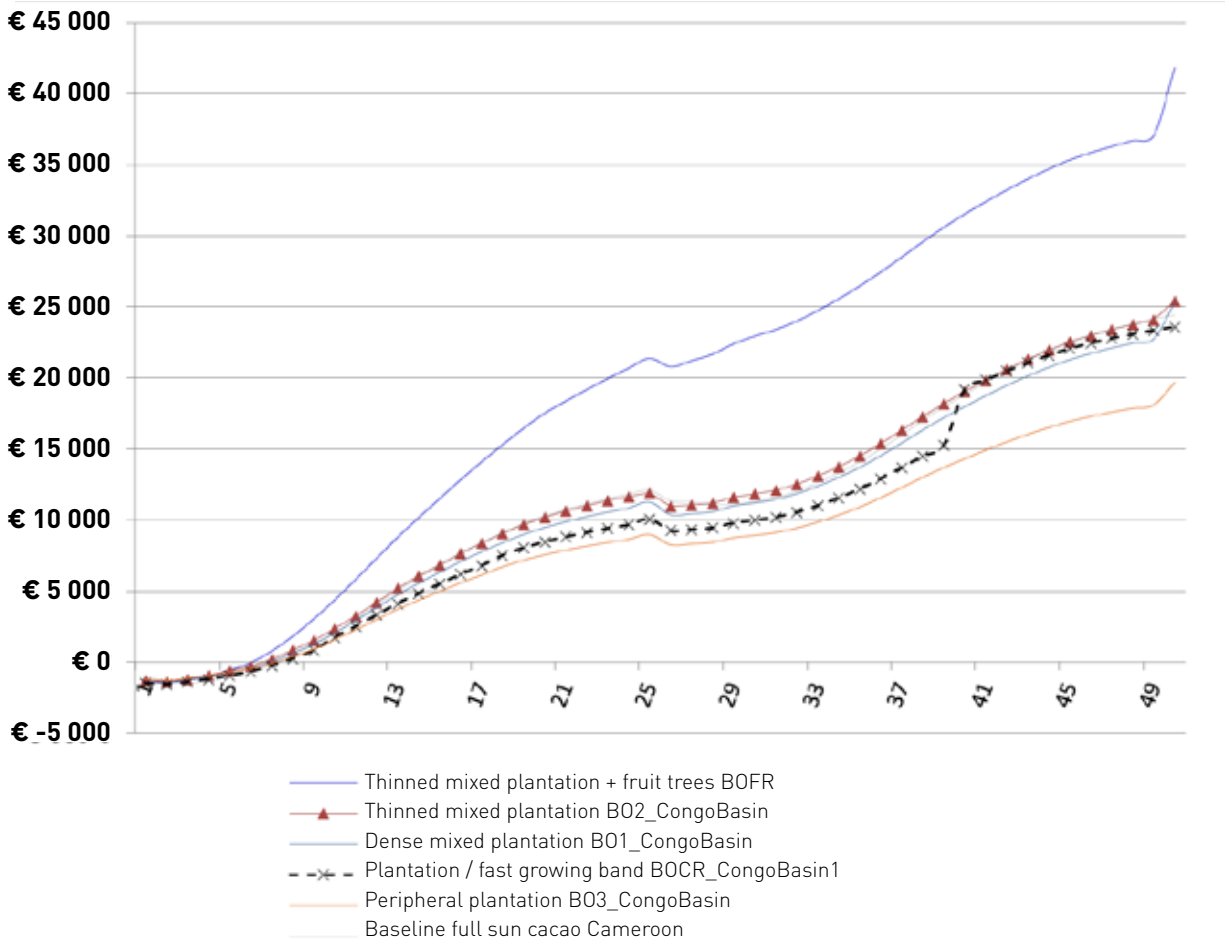
Annual income compared over 50 years

If the species chosen for the Congo Basin are thinned, as in Côte d'Ivoire, the final harvest takes place for most models after 50 years. Thus, the latter do not make it possible to finance the costs of renewing the cacao plot (25 years). As we will see in the recommendations, it is of great interest to study pre-financing models based on future timber harvesting.



Cumulative income compared over 50 years

All models studied (except the one incorporating fruit trees) provide an income close to that of cacao trees grown in full sun, while experiencing the benefits of shading. The system that yields the most in terms of cumulated income is the one which combines cacao trees + timber species (in medium density) and fruit trees. The quantity of wood harvested is significant (13m^3/ha/year on average), with an average income per family worker of €20/working day (compared to €13/day for cacao in full sun).



4.3.4.4 - Results summary

Cultivation systems by region	Description	Average no. man-days annually/ ha	Average no. man-days per family annually/ha	average annual costs/ha	average annual income /ha	Income/ man-days family
Côte d'Ivoire						
Baseline_RCI	Cacao trees in full sun 1,320 trees/ha	77	42	€ -258	€ 414	€ 10
BO1_RCI	Mixed dense	66	34	€ -228	€ 405	€ 12
BO2_RCI	Mixed thinned	68	36	€ -231	€ 359	€ 10
BO3_RCI	Peripheral plantation	52	27	€ -181	€ 278	€ 10
BOCR_teck_RCI	Fast-growing bands	58	30	€ -205	€ 286	€ 10
BOCR_gmelina_RCI	Plantation / band	59	30	€ -205	€ 313	€ 11
BOFR	Thinned mixed + fruit trees	70	40	€ -221	€ 691	€ 17
Congo Basin						
Baseline_Congo	Cacao trees in full sun 1,111 trees/ha	69	37	€ -251	€ 488	€ 13
BO1_Congo	Mixed dense	69	35	€ -249	€ 506	€ 14
BO2_Congo	Mixed thinned	72	37	€ -259	€ 508	€ 14
BO3_Congo	Peripheral plantation	56	28	€ -203	€ 394	€ 14
BOCR_1Congo	Fast-growing band	63	31	€ -229	€ 472	€ 15
BOFR	Thinned mixed + fruit trees	75	42	€ -248	€ 836	€ 20

4.3.5 - Environmental benefits compared for the different techniques

The estimate of the expected timber volume (and therefore biomass production, excluding roots and branches) is as follows:

Congo Basin			**PROD**
Cultivation system	**Species**	**Initial density/ha**	**m³/ha/year**
Dense mixed plantation	Various species	84	3.15
Thinned mixed plantation	Heliophytes (Ayous)	23	1.44
Peripheral plantation	Heliophytes (Ayous)	124	15.77
Plantation/fast growing band	Exotic (teak)	198	19.08
Thinned mixed plantation + fruit trees	Heliophytes	40	13.33
Côte d'Ivoire			**PROD**
Cultivation system	**Species**	**Initial density/ha**	**m³/ha/year**
Dense mixed plantation	Various species	84	5.60
Thinned mixed plantation	Heliophytes (frake)	23	1.80
Peripheral plantation	Heliophytes (frake)	124	20.07
Plantation/fast growing band	Exotic (teak)	198	18.31
Plantation/band	Exotic (gmelina)	198	26.31
Thinned mixed plantation + fruit trees	Heliophytes	40	13.33

These volumes should be compared with possible needs for the **renewal of part of the national plantations** affected by CSSV or which are ageing (Côte d'Ivoire, Ghana) or the reparation of degraded forest landscapes or the reforestation of savannahs based on agroforestry systems (Congo, Cameroon).

In addition to these sequestration volumes, there are naturally **savings in pesticides** and **reduced sensitivity to drought** due to agro-ecological practices.

4.4 - DISCUSSION ON THE REMOVAL OF THE DIFFICULTIES RELATED TO THE IMPLEMENTATION OF AGROFORESTRY PROJECTS FOCUSING ON SHADE-GROWN CACAO

At the end of the field mission phase and after the interviews conducted, it appears that the cacao/forest plantation agroforestry model system for timber production (aiming for real economic profitability in the two domains) is a very innovative approach in the Congo Basin but also in Côte d'Ivoire where logging companies are involved in plantation projects with chocolate companies so as to meet compensatory reforestation obligations rather than aiming for a return on investment and collection of funds in the long run.

Like any innovative strategy, prerequisites must be met or barriers (usually institutional) must be lifted. The following paragraphs present these different elements.

4.4.1 - Remuneration systems for tree planters

The subject of one of the proposed projects is the assessment of interest and advance payment terms or payment at a later date for timber, while maintaining a sustainable partnership between cocoa farmers and logging companies (see Table 3 and Chapter 5). In all cases, the contractual and long-term schemes to compensate the planter involve GPS mapping tools (location of the tree, number of trees on the plot) and tree monitoring (maintenance and upkeep), to be discussed according to different scales and paid stakeholders (individual farmers, cooperatives?). It will undoubtedly be necessary to set up a monitoring and maintenance logbook to ensure compliance with certain specifications.

Table 6: Non-exhaustive list of financial schemes to be studied

	Logging company	Operators, technical advisers	Microfinance	Cocoa farmers
Final payment	The simplest and safest scheme	Technical follow-up, support and advice to cocoa farmers	Can play a role in advancing funds	Less incentive mechanism, unless microfinance is involved
Periodic payment (e.g. 10-15-25 years)	Intermediate mechanism ensuring both management of plantation quality and limited risk-taking			Intermediate solution that helps finance large one-off expenses without waiting for the end of the cycle
Annual payment	Very complex scheme			Moderately incentive mechanism because very small amounts

4.4.2 - Strengthen research on cacao grown under the shade of timber species

There are still unknowns about the tree species planted in cacao plantations. Most of the projects identified are experimental. There should be some permanent monitoring of plots (monitoring of biomass and cocoa production).

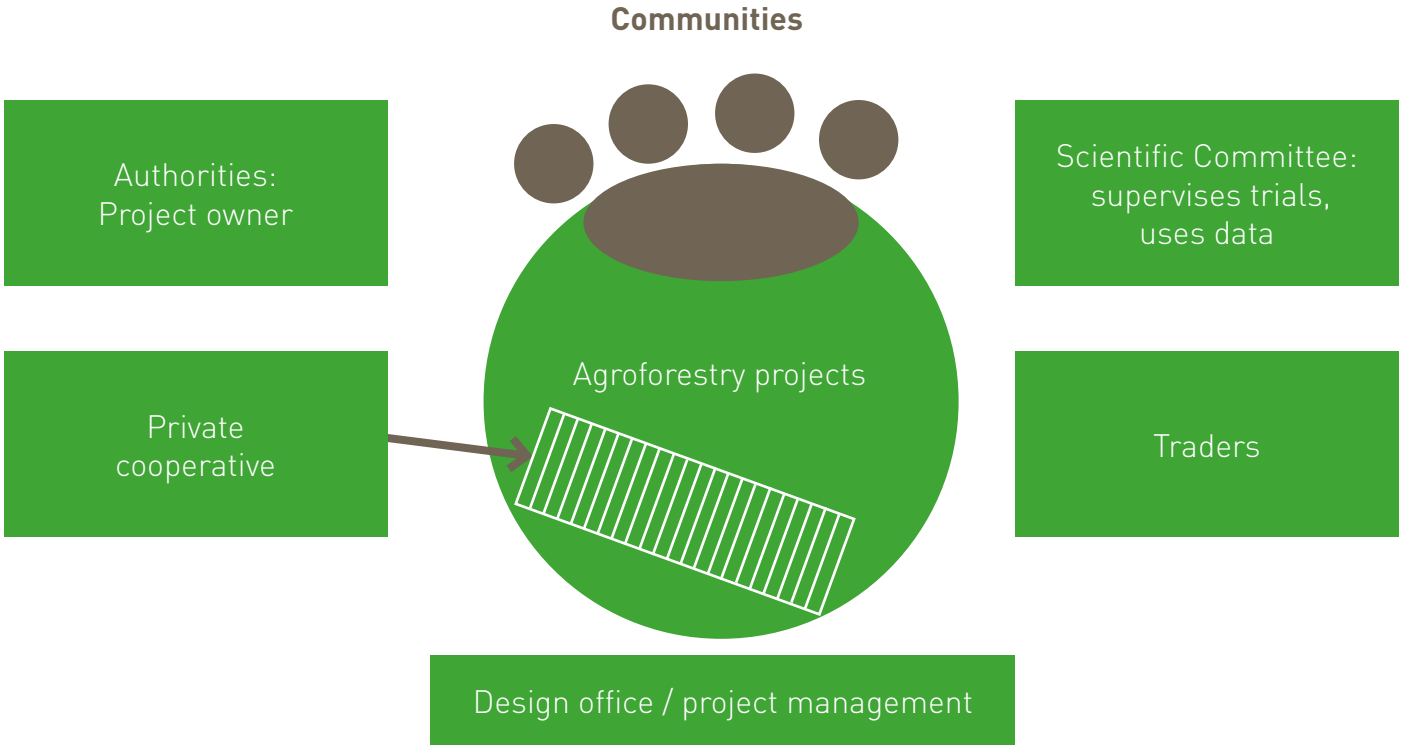
4.4.3 - Encouraging logging companies and chocolate companies to work together

While this partnership works well in Côte d'Ivoire, it still needs to be built in other countries. Seen from the cocoa world, the combination of cacao + timber species is still too often limited to the need to certify cocoa (regardless of the quality of the timber) or to diversify farmers' incomes in the short term (profitability calculations are therefore limited to cocoa, fruit and some NTFPs, with no proper assessment of timber income being made). Thus, it would be advisable to continue to exchange points of view and combine needs so as to draw up common strategies, while using complementary expertise.

The essence of the ideas of projects 2 and 3 of Part 5 of the report is precisely to go beyond experimental frameworks to attempt large-scale collaborations on a site where land is well-controlled and there is the possibility of strong involvement with local communities.

The following diagram, designed for Cameroon, for example, brings together in one place (an «agroforestry development site»):

- Farmers who implement small farmer cacao groves
- Logging companies pooling the compensatory reforestation obligations of several companies and controlling forest nurseries that are useful to them and to farmers
- Cocoa buyers who have access to traceable cocoa, zero deforestation cocoa, or even cacao crops which benefit the forest
- Support structures: authorities, researchers, credit organisations.



4.4.4 - Experience transfer between the two regions

Cameroon has long-standing experience in cacao agroforestry and in forest nursery management. Côte d'Ivoire has some pioneering initiatives bringing together logging companies and chocolate companies. Undoubtedly an exchange between the two countries, and their two regions would be beneficial, within the framework of multi-country projects (research or development projects) and thematic forums.

5. PROJECT IDEAS

At the end of this overview of the strengths and weaknesses of shaded cacao crops, we were able to identify the project ideas summarised in the table below:

	Projet 1 : Social	Project 2: Pilot project for environmental and economic restoration of degraded forests	Project 3: Support to agroforestry project	Project 4: Research support	Project 5: Payment for Ecosystem Services (PES) Financing	Project 6: Support to nurseries	Project 7: Feasibility study of a cacao agroforestry label
Title	Income-generating social development project in villages bordering forest concessions, based on agroforestry cacao systems	Promotion of cacao agroforestry systems with participation of local populations with the aim of economic and ecological restoration of degraded forests	Reforestation project for agricultural land or forest land degraded by shaded cacao crops («cacao/afforestation»)	Establishment of an international network of permanent agroforestry cacao plots	Study of compensation schemes for shade trees in agroforestry contexts	Establishment of a strategy for the development of private forest nurseries	Objective of further exploring value creation opportunities for wood and/or cocoa produced from agroforestry systems
Area concerned	Non-Permanent Forest Estate on the periphery of FMUs or Community development series/ Agricultural series within concessions	Degraded forest concessions (Cameroon) Classified agroforests (Côte d'Ivoire)	Non-Permanent Forest Estate or rural domain (domaine rural)	Non-Permanent Forest Estate or rural domain (domaine rural)	n/a	n/a	Concessions or Non-Permanent Forest Estate
Main focus	Social development	Environmental	Economic	Scientific	Economic	Technical and economic	Economic
Direct beneficiary country	Cameroon, Gabon	Cameroon	Côte d'Ivoire: chocolate company-industrial partnerships	Cameroon, Côte d'Ivoire	Côte d'Ivoire	Côte d'Ivoire, Cameroon	Option 1: RCI Option 3: Congo Basin Others: all
Other country in the scope of the project	Congo	Concessions close to cities (e.g. Libreville)	Cameroon	Ghana (RRC), Congo (BM)	Congo	Congo	n/a
Partners	Wijma (Cameroon) CEB Precious wood (Gabon) IFO (Congo) Chocolate companies?	ANAFOR ProPFe (GIZ) Chocolate companies	Tranchivoire-CEMOI GFBC as part of its degraded forest are plantation project	International and national research organisations	• Logging companies • Chocolate companies	• Logging companies • Professional nursery growers, with experience of the species concerned	• NGO or company with experience of creating labels and certificates

	Projet 1 : Social	Project 2: Pilot project for environmental and economic restoration of degraded forests	Project 3: Support to agroforestry project	Project 4: Research support	Project 5: Payment for Ecosystem Services (PES) Financing	Project 6: Support to nurseries	Project 7: Feasibility study of a cacao agroforestry label
Beneficiary	• Certified concession • Neighbouring communities to project concessions	• State • Neighbouring communities • Logging companies bordering the FMU as part of a PPP	• Logging companies members of ATIBT interested in this approach • Chocolate companies: developing a sustainability approach in new countries	• All stakeholders in the cocoa and forest sectors as well as in research	• Farmers	• Private parties • Service cooperatives	• Farmers, cooperatives • Wood buyers
Context and challenges	• Obligation of FSC-certified companies to develop income-generating social projects • Populations already have knowledge of cocoa because there is already cocoa in the area (see South-West Cameroon) • Interest of logging companies in Congo Basin concessions to diversify their activity to maintain economic viability	• There are a number of FMUs in Cameroon that are heavily degraded by agriculture and logging. Compensation for some has been paid to ANAFOR =→ how to accelerate environmental and economic restoration of these areas. • GIZ is responsible for financing the development plan • Cocoa income is a tool to pay for part of the restoration work undertaken in related areas. • Possibility of contributing to reflection on the status of the concession and the associated legislation (agroforestry concessions)	• In Cameroon, a ministerial decision requires the reforestation of 50 ha/year/FMU as a contribution to the national effort. Implementation is difficult because surfaces are not identified within FMUs, and reforestation skills and knowledge only exist in a few certified companies • In Côte d'Ivoire, logging companies are required to carry out compensatory reforestation either in classified forests or in the rural domain • The economic project would make it possible to evaluate collaborations between professionals, notably members of the ATIBT and between logging companies and chocolate companies.	• There is a relatively abundant bibliography on agroforestry cacao farming models (Africa, South America, Asia) but despite this, there is little certainty • There are a multitude of more or less recent tests, some of which would have been conducted directly by operators with the support of producers • National research institutes have not managed the tests over long periods of time and are now facing projects with a short/medium-term approach • Many questions are asked about the most suitable techniques with both an agronomic and an economic approach	• In the most traditional situation, pre-existing timber-producing trees or those which need to be integrated into new cocoa farms are not considered by farmers to be income generators. On the contrary, awareness still needs to be raised to get people to at least accept the agronomic benefit of shading or soil improvement. On the contrary, these trees are often removed from cacao farming areas. • In northern Congo, payments for conservation are set out in the ER-P on a carbon fund fed by several donors (5 years).	• There will be a high demand for native species seedlings from natural forests • Some (certified) companies have developed experience and expertise in the creation of nurseries (seed collection, germination and breeding methods, transport, replanting), in particular Nature+/ University of Gembloux • There is probably an opportunity to make this service available to companies that do not have these skills by producing certified seedlings	There is a need for enhancing the value of cocoa and wood originating from shaded cacao farming systems. Several options should be evaluated: • Option 1: Create a new agroforestry reference system that integrates both cocoa, wood and forest • Option 2: Integrate agroforest wood into the OLB certification • Option 3: Take into account agroforestry in PAFC schemes (Congo Basin) • Option 4: Integrate producer remuneration for timber into cocoa payment • Option 5: Improve the specific tree category in the UTZ-Rain-Forest repository

	Projet 1 : Social	Project 2: Pilot project for environmental and economic restoration of degraded forests	Project 3: Support to agroforestry project	Project 4: Research support	Project 5: Payment for Ecosystem Services (PES) Financing	Project 6: Support to nurseries	Project 7: Feasibility study of a cacao agrofo-restry label
Objective	Demonstrate the feasibility of an agro-forestry cacao model in villages bordering concessions	• Restore very degraded areas of FMUs, savannah or agricultural areas • Demonstrate that the sustainable management of the agroforestry concession could be guaranteed both by the wood still available on degraded and historical-ly exploited forests and by cocoa revenues.	• Bring agroforestry back in the framework of this compulsory re-forestation in previously identified areas • Feed discussion on the establishment of unifying projects (Ca-meroon) • Create the condi-tions for a win-win partnership between logging companies, chocolate companies and producers based on the Ivorian experience • Better communicate about cocoa reforesta-tion (chocolate compa-nies) and demonstrate the feasibility of this innovation (forestry)	• Draw up a refined bibliographic analysis • Evaluate old and current devices in terms of interest, performance, scien-tific value, statistical representativeness and sustainability • Set up tests • Organise knowledge sharing in an informa-tion management system (NTIC), a resource platform • Organise forums/ experience sharing meetings	• Find financial compensation schemes that allow farmers to keep trees in the middle of their cacao trees in the long term	• Assess the economic model and the prospects for the development of a strategy for the production of certified native forest species seedlings (according to t echnical specifications)	• Feasibility study of some certification priorities for shaded cacao systems

	Projet 1 : Social	Project 2: Pilot project for environmental and economic restoration of degraded forests	Project 3: Support to agroforestry project	Project 4: Research support	Project 5: Payment for Ecosystem Services (PES) Financing	Project 6: Support to nurseries	Project 7: Feasibility study of a cacao agrofo-restry label
Action content	**Phase 1: Feasibility study (1 year)** • Detailed description of the project areas: identification of suitable areas on the land (excluding FMUs in Cameroon and in the community development series within the concessions in Gabon and Congo) • Feasibility study of microcredit and service structures • Sizing of cacao agroforestry project **Phase 2: Implementation (3-4 years)** • Recruitment of a Technical Assistant • Installation of microcredit facility • Implementation of plantations and maintenance • Follow up under the guidance of the Technical Assistant • Project assessment	**Phase 1: Studies** • Through planning studies (inventory, soil study, socio and economic study), identify within the FMU the areas where shaded cacao cultivation can be made or agroforestry plantations in very degraded areas • Technical and institutional feasibility study for project ownership and project management (more or less extensive involvement of ANAFOR, intervention of subcontractors, roles of local populations, intervention of neighbouring logging companies) • Study of financial mana gement schemes **Phase 2: Implementation** • Implementation of plantations and maintenance • To see with GIZ extent of their involvement	• Meetings between logging companies and chocolate companies • Cameroon (concession 8-008 and xxx land reserve) • Cameroon: Technical and institutional feasibility study (project ownership and project management) • Côte d'Ivoire: provide additional support for ongoing projects	• Meta-analysis of the existing situation • Scientific monitoring of trials in progress • Find tools to fund additional trials • Research focus 1: Test different scenarios x species • Research focus 2: Establish an analysis of the growth rates of planted native species as well as the allometric equations of agroforestry cocoa models in order to evaluate the role of carbon in detail • Research focus 3: Test and validate pruning systems • Research focus 4: Modification of industrial tool to adapt to new products resulting from these models • Identification of the quality of wood from plantations with very wide spacing • Organise and disseminate information	• Analyse the growth of the tree to make volume projections • Prospective view of tree value • Establish farmer compensation schemes for the maintenance of timber trees (PES, tree financing, per hectare) • Contractualisation mode between the producer and the industrial logging company (delayed payment, in advance, annually, etc.) • Analysis of the benefits of the certification tools for the producer • Engagement of certified cooperatives as payment vehicles and training facilitators	• Needs and demand assessment • Identification of technical gaps by species • Creation of specifications for the natural forest plan • Nursery training package (collection area, provenance and quality analysis, guarantee of recovery) • Identification of potential carriers among logging companies or beyond • Economic model for the nursery function (technical support, etc.) • Analysis of a vitroplants option	Feasibility study

	Projet 1 : Social	Project 2: Pilot project for environmental and economic restoration of degraded forests	Project 3: Support to agroforestry project	Project 4: Research support	Project 5: Payment for Ecosystem Services (PES) Financing	Project 6: Support to nurseries	Project 7: Feasibility study of a cacao agroforestry label
Risks	• Constancy of dealer commitment • Acceptance of approach • Market access for agroforestry products	• Technical capacities of ANAFOR on this innovative subject • Institutional stability of ANAFOR • Definition of an institutional framework for agroforestry concession	• Temptation to go to full sun + cacao/tree trade-offs	• Long-term sustainability of protocols and funding of measures • Competition between chocolate companies may lead them not to share test results	• The ability of farmers to employ methods	• In the short term: possibility for logging companies to sell seedlings • In the medium term: Competition with seedlings from very diverse and untraceable sources	• If the positioning is not clear, there is a risk of becoming one more logo in the already complex set of labels on chocolate bars. • Similarly, risk of duplication with labels such as the RainForest label
Budget	• Phase 1: €50,000 (short term expertise PPECF) • Phase 2: to be calculated (€2500/ha on basis of 100 ha)	• Phase 1: to discuss with GIZ • Phase 2: to discuss with GIZ	To be defined	Budget to be received from CIRAD as a benchmark	To be evaluated	To be evaluated	To be evaluated according to the scope of the study (benchmark or benchmark plus establishment of a work plan)
Potential donor	• Feasibility study: PPECF • Project: co-financing to be identified during the feasibility study	KfW via GIZ		• The question of experimental measures also arises in the ER-P Congo → synergies to be found	• PPECF has a PES component provided it is linked to a certified company		

6. CONCLUSIONS

At the end of this study, we can note the following key elements:

• There are a multitude of cacao + timber species combination models that are implemented at the trial stage on a small scale, produced by research actions or as part of local initiatives. The choice of techniques depends primarily on the production goals.

• There is a convergence of interests, and even the beginning of a movement (especially in Côte d'Ivoire) uniting chocolate companies and logging companies on common issues - climate, source sustainability, living conditions of farmers.

• There are uncertainties related to the more or less favourable/secure nature of existing legislation. In all cases, there will be a need to adapt the existing legal framework.

• There are important reflections currently being made on the conditions to be created to support shade-grown cacao systems - access to quality plant materials, technical support for the proper maintenance of forest species, access to adapted financial products, etc.

• The cacao + timber species combination model is a virtuous model that can perfectly meet certain requirements of the FSC/PAFC forest certification, particularly with regard to the needs of proposing neighbouring populations integrated income-generating development projects. In the longer term, this reflection and these perspectives are in line with the current concerns raised by the ATIBT on the economic model of logging concessions in the Congo Basin which will undoubtedly be looking for successful economic diversification ideas from an environmental and social point of view.

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The French Facility for Global Environment (FFEM) is a financial instrument of the French cooperation and development policy which is dedicated to the protection of the environment. Its mission is to cofinance projects which have a strong environmental component in developing and emerging countries. Since 1994, it intervenes in the following six global environment fields: biodiversity, climate change, international waters, land degradation, chemical pollutants and the stratospheric ozone layer. It is steered by an interministerial committee (finances, foreign affairs, environment, research, agriculture) and the French Development Agency (AFD). The AFD is in charge of its secretariat and financial management. On the 31st of December 2016, the FFEM has cofinanced 301 projects totalling 355 million Euros, 68% of which are located in Africa and the Mediterranean region.

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