

**Adaptation Benefits Mechanism (ABM) Activity Description Document (ADD)
Deploying Sustainable Agroforestry Practices In Cocoa Plantations Including
Shading Trees Planting, Intercropping, Application Of Rescue Irrigation (micro
irrigation), Cote d'Ivoire**

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Project type	Deploying sustainable agroforestry practices in cocoa plantations including shading trees planting, intercropping, application of rescue irrigation (micro irrigation)
Sector/sub-sector/type	Agriculture/Agroforestry/Cocoa production
Climate risks occurrence	Sudden extreme events and slow onset events
Climate change parameters	Precipitation and temperature
Climate change hazards	Drought and heat wave
Type of adaptation and resilience measures	Application of sustainable agroforestry practices in cocoa plantations including: <ul style="list-style-type: none"> - shade trees planting, - intercropping for income diversification - rescue irrigation
Adaptation benefits	The overarching benefit is the output: <ul style="list-style-type: none"> - Cocoa plantation under Sustainable and Climate-Resilient practices (SCR) (ha), The detailed benefits are also measured: <ul style="list-style-type: none"> - Improved survival rate of cocoa saplings at farm establishment (percentage of planted seedlings) - Complementary farm output (USD/ha) - Enhanced productivity of cocoa farm (kg of cocoa beans/ha)
Implementation area	Targeted implementation area = 3,000 ha meaning 3,000 SCR to be generated A total of 3,000 farmers are expected to benefit from the project, as only one hectare of farm is supported per farmer.
Cost of implementation (USD)	The incremental cost of 1 SCR is three thousand two hundred fourteen US dollars and five cents (USD 3,214.5) The total cost of implementation is Nine million six hundred forty-three thousand five hundred US dollars (USD 9,643,500)
Applied Methodology	ABM Methodology Cocoa Resilience Version 1
Project technical partner	Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF)
Contacts (Legal entity to receive the payments)	Fonds Interprofessionnel pour la Recherche et le Conseil Agricoles (FIRCA) www.firca.ci OR https://www.greenclimate.fund/ae/firca Mr. KOUADIO Kouacou Fidèle, kouadiokf@firca.ci Mr. NDIAYE Oumar, Executive Director, ndiayeo@firca.ci

1. About the adaptation project

1.1. Project title

Cocoa livelihood resilience-enhancing the resilience of smallholder cocoa farmers in Côte d'Ivoire

1.2. Rationale

The West-Central Africa Cocoa Landscape is the largest cocoa bean production zone in the world, where Côte d'Ivoire (42.5%), Ghana (11.7%), Nigeria (5.2%) and Cameroon (5.2%) account for 40%, 20% and 5% of world cocoa production, respectively [1]. In Côte d'Ivoire, cocoa production accounts for 15% of the Gross Domestic Product (GDP) and 43% of exports. More than 2.5 million Ivorians are involved in cocoa production and feeding the chocolate market with an estimated US\$64 billion [2].

Cocoa production in the region faces significant environmental and climatic changes that already challenge the livelihood of millions of cocoa producer households. Climate desiccation process was noticed since 1970s in Côte d'Ivoire. Elevated temperatures and longer dry seasons were already occurring at higher frequencies. According to the IPCC Sixth Assessment Report (AR6), West Africa has already experienced a rise in average annual and seasonal temperatures of 1–3°C since the mid-1970s with the highest increases in the Sahara and Sahel. Heatwaves are projected to become hotter, longer, and more frequent. Under global warming of 1.6–2.5°C, West Africa could face 50–250 days per year of potentially lethal heat [3].

For cocoa, a crop highly sensitive to temperature and water stress, this trend directly threatens survival and productivity, as excessive heat reduces flowering, pod set, and bean quality [4].

In parallel, drought frequency and intensity have increased since the 1950s, with multi-year droughts becoming more common and expected to worsen under future warming. Given cocoa's reliance on stable rainfall and adequate soil moisture, recurrent droughts jeopardize yields, increase tree mortality, and force shifts in cultivation zones. The combination of more frequent heatwaves and prolonged droughts therefore makes cocoa production in Côte d'Ivoire especially vulnerable, underscoring the urgency of adopting adaptation strategies such as shade-based agroforestry, soil moisture conservation, and climate-informed farm management [5,6].

In these conditions, farmers repeatedly established new cocoa farms in the remaining forest areas where microclimate is still suitable to cocoa growing. That led the cocoa production basin to continually move from the already degraded lands to the new forest zones. This resulted in one of the alarming deforestation trends in the World, important biodiversity loss, large land degradation, and ultimately increased vulnerability of farmers (women, youth, and men). As climate change is likely to drive more temperature increases [7] and more rainfall uncertainties, these problems are going to exacerbate in the decades to come [6].

1.3. Objectives

The overarching objective is to enhance smallholder cocoa farmers' resilience in a deforestation-free cocoa landscape. For this to be achieved, the project is specifically designed to:

- train smallholder cocoa farmers on agroforestry and rescue irrigation,
- distribute agroforestry planting materials and equipments for rescue irrigation,
- and evaluate and report on the Adaptation Benefits associated with cocoa plantation areas managed under sustainable and climate resilient practices.

1.4. Alignment with National and Global Adaptation Frameworks

These objectives align with Côte d’Ivoire’s NDCs, which aim to reduce vulnerability in the agriculture, livestock, and aquaculture sectors [8]. The project supports the Global Goal on Adaptation (GGA) by strengthening the resilience and adaptive capacity of smallholder cocoa farmers. By applying an Adaptation Benefits Mechanism (ABM) methodology, it also advances Article 6.8 of the Paris Agreement, which promotes non-market approaches for adaptation and sustainable development. This generates verified adaptation benefits that will enhance Côte d’Ivoire’s capacity to mobilize additional finance for adaptation in the cocoa sector.

2. Methodology

2.1. Selected methodology

The benefits of the project will be assessed using the methodology “Sustainable Agroforestry for enhancing the resilience of smallholder cocoa farmers against drought, rising temperature and heat waves- Version 1”. The justification of its applicability to this project is summarized in table 1.

Table 1: methodology applicability

Criteria	Required conditions	Compliance in this project
<i>Sector</i>	Agriculture - crop production.	Cocoa beans production.
<i>Sub-sector</i>	Agroforestry	Cocoa agroforestry
<i>Vulnerability to climate change hazards</i>	Heat waves, drought, precipitation variability	Heat waves, drought
<i>Farming system</i>	Introduction of a sustainable agroforestry practices or a package of practices to enhance the resilience to the climate hazards of cocoa production systems that are either full-sun cocoa monocultures or systems that already include shade trees, but are not sufficiently effective against the climate hazards	The project aims at introducing sustainable agroforestry practices with rescue irrigation to enhance the resilience of smallholder farmers against the effects of heat waves and drought in cocoa production systems of Vavoua and Soubre (Côte d’Ivoire). In both areas, cocoa production is conducted in full-sun cocoa monoculture or with some random trees that afford insufficient protective shade against heat waves and drought.
<i>Cocoa value chain related criteria</i>	Only on-farm management practices	The project activity deals only with on-farm

Criteria	Required conditions	Compliance in this project
		management practices, namely agroforestry and rescue irrigation.
<i>Access to planting materials</i>	Smallholder cocoa farmers have access to high quality seeds and saplings for shading and intercropping, materials for irrigation, trainings of smallholder cocoa farmers on climate change, and use of irrigation.	Farmers, including women, are supplied with high-quality seeds, saplings and training.
<i>Exclusion criteria related to deforestation</i>	Farming systems not resulting in deforestation including plantation installed in protected areas.	The selected sites in both localities are not in protected areas. They are existing fallow of old cocoa farms (aged or destroyed by swollen shoot disease)

2.2. Adaptation benefits identification

2.2.1. Theory of change

Cocoa tree (*Theobroma cacao*) is an understory species since its natural environments are humid tropical soils partially or entirely covered by rainforests trees. When cocoa trees are grown under limited or no shade, it is easily stressed when intense droughts and/or heat waves occur. Under the desiccating climate of West Africa where 70% of the world cocoa [1] is in full sun monoculture, intense droughts and heat waves regularly induce high rates of young cocoa trees mortality while reducing the lifespan of adult cocoa trees [9]. This easily leads to cocoa farm establishment failures, massive income loss in full grown cocoa plantation, increased cocoa farm destruction by diseases, early ageing of unshaded trees (reduced productive period of cocoa trees), and precarious livelihood for farmers whose 74% income is provided by raw cocoa bean selling [9]. In this context, farmers struggle to create or regenerate cocoa farms by replanting degraded plantations [10]. Oftentimes, these farmers search for new forest areas that exhibit better suitability for cocoa growing [11]. This led to highly disrupted livelihoods, massive deforestation, biodiversity loss [12], widespread soil degradation, and encroachments of protected areas. Meanwhile, the root problem – the inadequacy between the farm practices (unshaded cocoa systems) and the climatic conditions - is predicted to worsen because of climate change [6].

In this context, sustainable agroforestry practices are deemed to concurrently mitigate the effects of droughts and heat waves while contributing to reduce deforestation [13]. Indeed, it is well established that purposely designed cocoa-based agroforestry systems significantly reduce young cocoa trees mortality, maintain stable production, and extend adult cocoa trees lifespan [13]. This helps farmers stay on the same patches for at least 60 years, cutting the trend of deforestation while increasing the rate of regeneration of fallow land. But not every agroforestry practices provide such resilience effects, and those that do are poorly known by many stakeholders especially smallholder farmers.

At least, if the smallholder farmers become enough knowledgeable on resilient agroforestry practices while having access to seedlings, they will adopt agroforestry for securing multiple outputs and outcomes. According to several peer-reviewed research papers, sustainable cocoa agroforestry practices mitigate drought effects by improving soil moisture conservation, increasing rainfall infiltration, abating soil desiccation intensity during prolonged droughts, and reducing impacts of heat waves [9]. This means that by applying sustainable agroforestry, farmers will succeed in cocoa farm establishment better than before (positive for rural employment rate), experience less income uncertainty, and be able to stay on the same lands for longer periods - at least 60 years instead of 19-30 years. Additionally, as multi-purpose trees integrated in cocoa agroforestry systems help diversifying income streams, complementary farm outputs will be reaped by farmers on regular basis (mostly women) while contributing to better biodiversity [14]. This will improve farmers' capacities to cope not only with climate uncertainties but also with cocoa bean price volatility. Ultimately, they will be more resilient in a sustainable cocoa landscape.

Thus, it can be anticipated that if farmers are properly trained, and provided with proper seedling supports, they will adopt sustainable agroforestry practices and secure the following adaptation (co-)benefits: improved survival rate of cocoa saplings at farm establishment (or increased efficiency in cocoa farm establishment), extended farm productivity, complementary farm outputs, improved biodiversity, reduced land use change and improved carbon sequestration. These benefits will improve the cocoa landscape sustainability and ultimately farmers' resilience.

From this theory of change, the following result chain is drawn with the objective of improving smallholder cocoa farmers' resilience in the context of the regions of Vavoua and Soubre (Côte d'Ivoire).

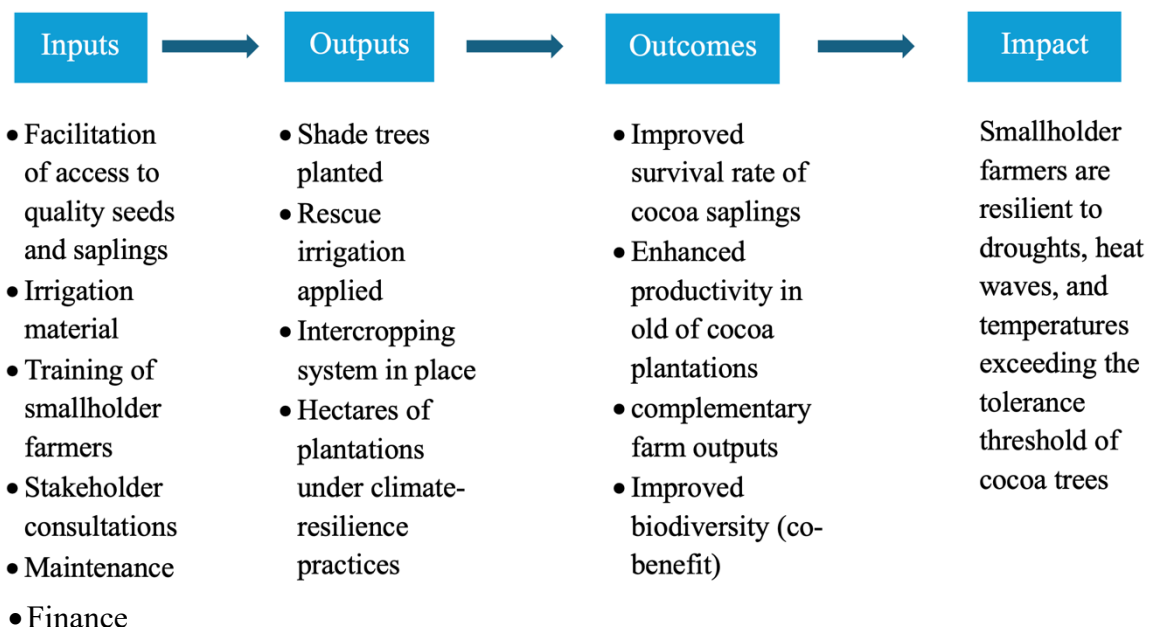


Fig. 1: Result chain

2.2.2. Adaptation benefits

Based on the above results chain and the applied methodology, the measured adaptation benefits of this project are Certified Adaptation Benefits (CABs), determined when cocoa trees at three years of age. In this case, one CAB is one hectare of cocoa plantation under sustainable and climate-resilient practices.

2.3. Demonstration that the activity is new and not business as usual.

Step 1 – NDC Check: Cocoa agroforestry practices are not explicitly included in the unconditional components of Côte d’Ivoire’s NDC [8]. While the NDC identifies forestry and agriculture as priority sectors and promotes general measures such as sustainable agriculture, afforestation, and reforestation, it does not specifically refer to cocoa agroforestry systems or define targets and financing mechanisms for their implementation. Accordingly, the proposed activity is consistent with the NDC’s overall objectives but represents a more targeted and operational contribution to achieving its adaptation goals in its agricultural sector.

Step 2 – Laws and Regulations Check: There are no widely enforced laws or regulations mandating cocoa agroforestry implementation in Côte d’Ivoire. Although policies encourage tree planting or sustainable agriculture, compliance is voluntary and enforcement on the ground is very limited, particularly in rural cocoa-growing regions. Surveys conducted by the project promoter [10] confirm that farmers are not legally required to adopt agroforestry practices.

Step 3 – Common Practice Check: Although tree distribution campaigns have been conducted previously in Côte d’Ivoire, they are not yet common practice in the target regions. Existing initiatives show very low survival rates of distributed cocoa seedlings (<2%) [16] and surviving shade trees are frequently cut down during farm management due to poor agroforestry techniques among sharecroppers and other farm workers [16]. Field assessments indicate that only a small fraction of cocoa farmers consistently maintain agroforestry systems [17], demonstrating that the practice is **not widespread** in the target area.

Step 4 – Barriers Demonstration:

- **Step 4.a – Investment Barrier:** Cocoa agroforestry involves substantial upfront investment in seedlings, labor, and training. While the profitability of a Sustainable Climate-Resilient plantation analysis shows good financial performance over a 10-year horizon (NPV = USD 11,210.87; IRR = 22.24% exceeding WACC of 7%), cash flows become positive only from Year 6, and the initial investment is fully recovered only by Year 9 and 2 months (Spreadsheet of Appendix 3). This delayed payback period means that, despite medium-term viability, smallholder farmers face high short-term financial risks that they are often unable without external support. No government or private entity has committed full funding to cover these costs over the next five years, making ABM support critical to trigger adoption at scale.
- **Step 4.b – Technology or Practice Barrier:** The activity faces technical barriers. Farmers and farm-level workers lack the knowledge and skills required to successfully implement the proposed agroforestry package of this project. Seedling survival rates remain extremely low due to poor planting and maintenance practices [16]. Although *rescue irrigation* was successfully tested and yielded highly satisfactory results according to cocoa stakeholders, its wider replication requires large-scale training on tube preparation and installation. Overcoming these technical barriers

requires trainings and access to suitable germplasm, which are not currently available at scale.

- **Step 4.c – Access to Finance Barrier:** Although long-term financial projections indicate profitability, smallholder farmers face limited access to capital due to real or perceived investment risks, including the delayed recovery of initial costs and uncertainties from climate variability or crop yield fluctuations. Sensitivity analysis confirms that even under pessimistic scenarios (IRR = 30.48–32.25%), returns remain positive (47,216.4 – 54,272.5 USD) (Spreadsheet of Appendix 3), but short-term cash flow deficits persist in the early years. ABM support is therefore required to overcome this access-to-finance barrier and de-risk the investment.

In light of these constraints, and considering that no government or private investor has committed to fully funding these activities within the next five years, the proposed activity would not be implemented without ABM support. De-risking the project is therefore indispensable to attract co-financing and to enable the large-scale implementation of climate-resilient agroforestry in Vavoua and Soubré.

2.4. Baseline methodology

2.4.1. ABM activity boundary

- Technological boundary

Among the 8 steps of the cocoa value chain, this project applies only to the production stage, the cocoa trees growing (Fig 2). This stage constitutes the foundation of the entire cocoa value chain, as all subsequent stages (harvesting, processing, trading, manufacturing, and distribution) depend on a resilient and sustainable supply of cocoa beans.

Given this reality, all stakeholders—including farmers, cooperatives, research institutions, processors, exporters, and the chocolate industry—are directly dependent on the sustainability of cocoa production systems. Therefore, ensuring sustainable cocoa production is not solely the responsibility of producers but a shared need across the entire value chain. Strengthening this stage through sustainable and resilient practices is essential to securing both the livelihoods of smallholder farmers and the resilience of downstream actors who rely on a stable and traceable cocoa supply.

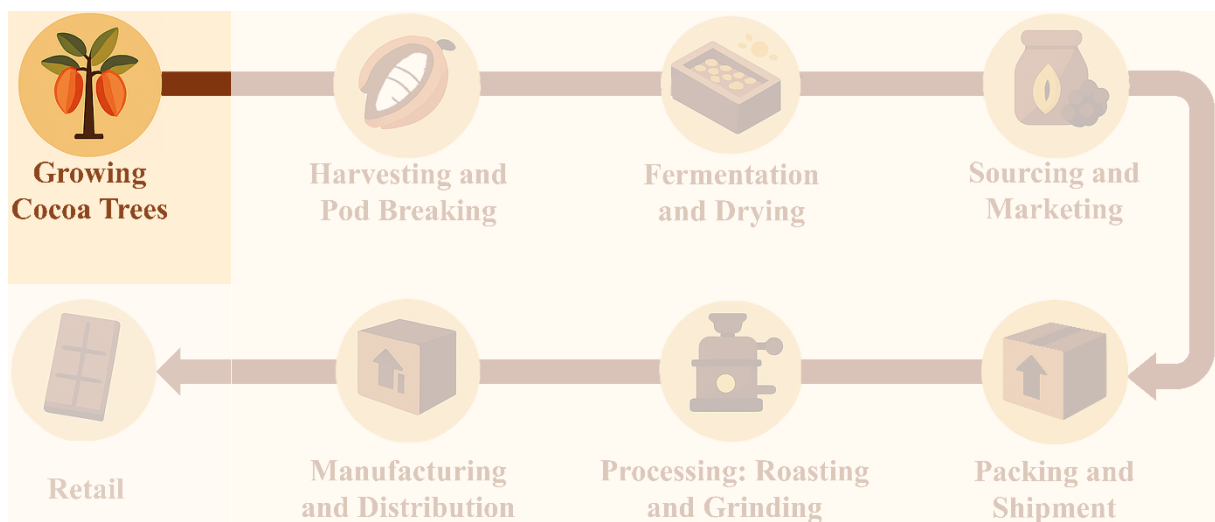


Fig. 2: Technological boundary of the project activity

- Geographic boundary

The geographic boundary includes two specific cocoa-growing regions in Côte d'Ivoire (Fig. 2), Soubre in the South-West and Vavoua in the Central-West. Both areas are in the same longitude range (6.2° W and 6.8° W) but different latitudes. Vavoua is between latitude 7.0° N and 8.0° N and Soubre between 5.7° N and 6.2° N.

Vavoua annual precipitation is in the range 1100-1350 mm with maximum temperature of 36°C in dry season. Vavoua is thus in the marginal cocoa production area of Côte d'Ivoire. Precipitation in Soubre is between 1250 mm and 1500 mm with maximum temperature of 35°C . Most of the inhabitants are smallholder cocoa producers: 93% in Soubre, from a population of approximately 1.01 million inhabitants and 95% in Vavoua, from a population of approximately 422,000 [17].

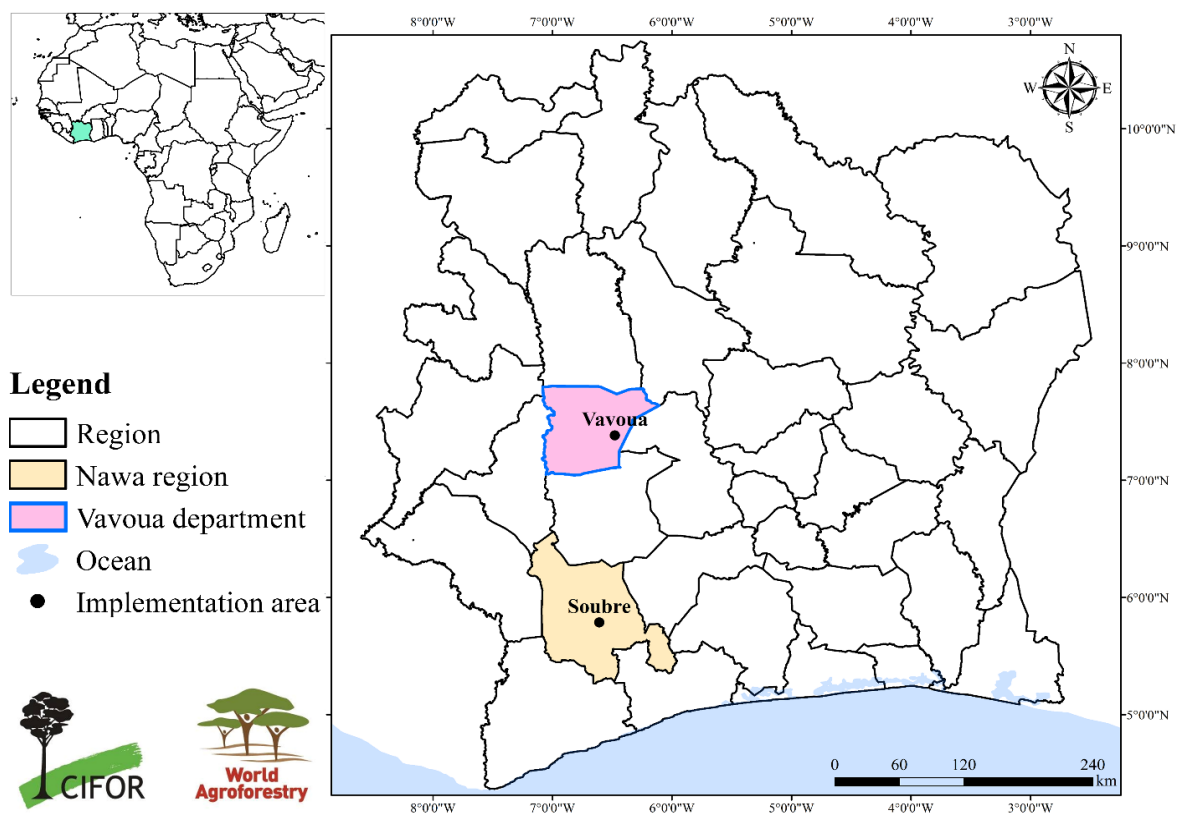


Fig. 1: Project implementation area

The impact of climate change on cocoa producing areas in Côte d'Ivoire is not homogenous including in the current project area. Agroclimatic zoning is thus required for differentiating homogeneous agroclimatic areas based on recent climate change impact study. According to the impact assessments (Fig. 3) Vavoua and Soubre experience different levels of climate change impact (Fig. 3). Vavoua is expected to register annual cocoa income losses reaching 60-100% and Soubre areas are predicted to register 30-50% income losses [18]. Given this difference, the baseline and monitoring methodology will be applied separately in each climatic zone. In other words, each zone will have its own baseline and monitoring data.

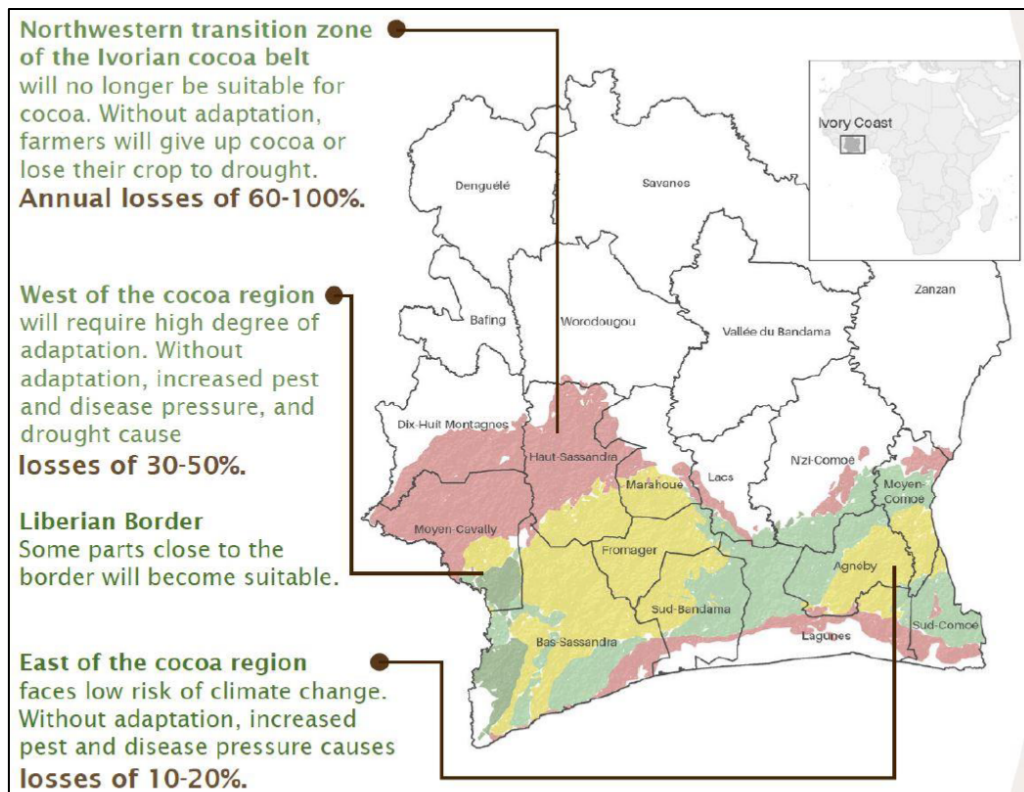


Fig. 2: Agroclimatic zoning based on climate change impact (Bunn et al., 2020)

2.4.1. Definition of the adaptation baseline scenario

Drawing on ICRAF's experience in the cocoa sector, farmers in the project area require trainings and access to suitable planting materials to adopt sustainable agroforestry practices. Without these requirements, cocoa production systems in Soubre and Vavoua would mainly consist of cocoa farms without sustainable and climate-resilient practices including in full sun monoculture or under very limited shade (up to 13% shade) [20].

Under this business-as-usual scenario, the production landscapes are increasingly degraded. The near absence of shade trees further exposes cocoa trees to extreme microclimatic fluctuations, such as excessive heat and moisture loss [21]. As a result, young cocoa plants experience very low survival rates, while mature trees suffer from shortened lifespans and increased vulnerability to drought [6]. These environmental stressors not only reduce productivity but also drive land-use expansion into forest areas, as farmers seek to compensate for declining yields [22]. This contributes to ongoing deforestation, loss of biodiversity, and increased carbon footprint, making the cocoa production system environmentally unsustainable [23].

At the socioeconomic level, the predominance of low-yielding and climate-vulnerable cocoa systems translates into low and unstable farmer incomes [11]. Smallholders remain heavily dependent on cocoa as their sole income source, leaving them highly exposed to both climate variability and international market fluctuations [24]. Limited access to financial services, technical support, and improved inputs further constrains their ability to adapt or invest in sustainable practices [25].

The situation also exacerbates rural poverty and gender inequalities, as women, though actively engaged in cocoa-related activities, often lack equal access to land, credit, and training opportunities [26]. The resulting economic insecurity discourages youth participation in cocoa farming and fosters a cycle of vulnerability, land degradation, and livelihood instability [27].

Overall, the baseline scenario reflects a climate-fragile (Table 2) and economically precarious cocoa production system. Environmental degradation and socioeconomic vulnerability are mutually reinforcing, undermining the resilience of both farming households and the wider cocoa value chain. Without targeted adaptation interventions to promote sustainable agroforestry, soil restoration, and diversified livelihoods, the sustainability of cocoa production in the project area will remain at serious risk.

Table 2: Climate trends in project zones

Indicator	Vavoua	Soubré	Interpretation / Relevance	Source
Rainfall variability	<p>High interannual variability in rainfall distribution and onset of rainy seasons</p> <p>Annual rainfall: 1,100–1,600 mm/yr (Bimodal regime)</p> <p>Unstable onset of rainy seasons; agricultural calendars disturbed; recurrent seedling losses reported</p>	<p>Increasing rainfall irregularity and variability in wet/dry season transitions</p> <p>Annual rainfall: ~1,069–1,800 mm/yr · (Bimodal regime)</p>	<p>Climate variability affects cocoa establishment, flowering, and survival</p>	<p>Giscard A.A. et al. (2022). Impact de la variabilité climatique sur les calendriers agricoles dans la sous-préfecture de Vavoua. <i>European Scientific Journal</i>, 18(27), 255.</p> <p>Yoroba F. et al. (2019). Evaluation of rainfall and temperature conditions for a perennial crop: cocoa in Côte d'Ivoire. <i>Advances in Meteorology</i>, Art. 9405939. doi:10.1155/2019/940593</p>
Dry spell occurrence	<p>Increasing occurrence of irregular dry spells during cropping seasons</p> <p>Dry spells >14</p>	<p>Increased frequency of consecutive dry days during sensitive crop periods</p> <p>Prolonged agricultural drought (soil</p>	<p>Dry spells increase seedling mortality and reduce cocoa productivity</p>	<p>Obahoundje S. et al. (2025). Implications of changes in water stress and precipitation extremes for cocoa production in Côte d'Ivoire and Ghana. <i>Int. Journal of Climatology</i>, e8872. doi:10.1002/joc.8872</p> <p>Giscard A.A. et al. (2022). <i>ESJ</i>, 18(27), 255.</p>

	consecutive days cause production drop; dry season >3 months not tolerated by cocoa	moisture deficit) in 2013 & 2015 extending May–Sep; Occurrences of more than 3 consecutive months with precipitation <100 mm/month		
Temperature trend	Progressive warming observed since the late 20th century	Progressive warming with increasing heat stress risk Temp increases: +0.9–2.0°C by 2041–2070	Cocoa productivity declines when temperatures exceed optimal thresholds	Kacou M'bo A.A. et al. (2023). Climate variability and outlook of cocoa production in Côte d'Ivoire under future climate. IntechOpen. doi:10.5772/intechopen.112643 Yoroba F. et al. (2019). Advances in Meteorology, Art. 9405939. Koné et al. (2023). Climate and agriculture in Côte d'Ivoire: impact of climate change on cocoa production by 2050. Int. Journal of Environment and Climate Change, 13(6). doi:10.9734/ijecc/2023/v13i61832
SPEI / drought tendency	Increasing drought sensitivity under combined rainfall and temperature stress Significant reduction in total annual precipitation over last 3 decades; greatest decline in 1991–2000 and 2011–2022		Negative SPEI tendencies indicate growing water stress affecting cocoa systems	Obahoundje S. et al. (2025). Water stress and precipitation extremes for cocoa in Côte d'Ivoire and Ghana. Int. Journal of Climatology, e8872. doi:10.1002/joc.8872
Cocoa climate vulnerability	High vulnerability due to transition-zone rainfall instability	High vulnerability linked to heat stress and rainfall irregularity	Up to 50% of currently suitable cocoa area in CIV at risk by 2050. Rainfall at or below cocoa	Kacou M'bo A.A. et al. (2023). Climate variability and outlook of cocoa production in Côte d'Ivoire. IntechOpen. doi:10.5772/intechopen.112643

	77.8% of farmers in Vavoua zone cite drought as leading climatic constraint on cocoa production	33°C threshold exceeded 92–142 days/yr in central/southern zones by 2041–2070 (RCP 4.5 / 8.5)	minimum threshold in transition zones. 77.8% of farmers report drought as primary climate risk	Yoroba F. et al. (2019). <i>Advances in Meteorology</i>, Art. 9405939. doi:10.1155/2019/9405939 Läderach P. et al. (2013). Predicting the future climatic suitability for cocoa farming of the world's leading producer countries. <i>Climatic Change</i> , 119, 841–854. doi:10.1007/s10584-013-0774-8
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2.4.2. Adaptation baseline

Adaptation baseline under option 1:

In baseline conditions, farmers aren't trained and not provided with suitable planting and irrigation materials. This results in zero hectares of cocoa plantation under sustainable and climate-resilient practices.

$$SCR_{BL} = 0 \text{ ha} \quad (1)$$

Where:

SCR_{BL} = Baseline area of cocoa plantations under sustainable and climate resilient practices

Adaptation baseline under option 2:

The baseline is also determined for “Survival rate of young cocoa trees (% of planted saplings)”; “Productivity of cocoa farming (kg of cocoa beans/ha)” and “Complementary farm output (USD/ha)”

- Baseline of survival rate of young cocoa:

$$SCR_{BL} = 100 * \frac{NS_{BL}}{N_{BL,COCOA,TOT}} \quad (2)$$

Where:

SR_{BL} = Survival rate of young cocoa trees planted under baseline (% of planted saplings);

NS_{BL} = Number of surviving cocoa saplings three years after planting under baseline, saplings/hectare.

$N_{BL,COCOA,TOT}$ = Total number of cocoa seedlings (including replanted saplings) at farm establishment. It depends on the recommended number of cocoa trees, the local climate (drought and heat) and the sensitivity of the cocoa germplasm to these climate risks.

- Baseline for enhanced productivity of cocoa farm

In both project areas, the baseline for enhanced productivity of cocoa farms is zero kilograms per hectare when cocoa trees, planted without protective shade trees, reach ages between 19 and 30 years old. This is what farmers in Soubre and Vavoua are observing as their cocoa plantations were established without protective shade.

$$PROD_{BL(31-60)} = 0 \text{ kg} \quad (3)$$

Where:

$PROD_{BL(31-60)}$ = production of cocoa farm aged between 31 and 60 years old under baseline condition (kg)

- Baseline for complementary farm output

In Soubre and Vavoua, the baseline complementary farm output consists solely of a perfectly pure monoculture. The additional earnings generated by species other than cocoa are negligible. Thus, the baseline complementary farm output accounts for cocoa earnings only (USD).

$$CO_{BL,t}(cocoa) = V_{BL,t}(cocoa) * P_{BL,t}(cocoa) \quad (4)$$

For:

$CO_{BL,t}(cocoa)$ = earnings from cocoa bean under baseline on the period t in USD;

$V_{BL,t}(i)$ = price of 1 kg of cocoa bean on the period t; expressed in USD/kg;

$P_{BL,t}(i)$ = production of cocoa (in kg) under baseline on the period t

The baseline of complementary farm output from all plant species is:

$$tCO_{BL,t} = CO_{BL,t}(cocoa) \quad (5)$$

Where:

$tCO_{BL,t}$ = baseline of complementary farm output

Table 3: Baseline data per zone

Zone	Cocoa survival rate (%) *	Baseline replanting rate (saplings/ha) *	Cocoa yields (kg/ha) *	Baseline shade coverage (%)**
Vavoua	29	895	200	13%
Soubre	36	806	250	13%

* ICRAF field data

** Becker et al, 2025

2.4.3. Adaptation activity scenario

Option1: Adaptation activity scenario under option 1

The area of cocoa plantation under sustainable and resilient practices is the total cocoa farm area covered by the ABM activity. It will be one of the project outcomes that can be claimed either at the establishment phase of the farm as well as at the adult phase.

One hectare of cocoa plantation under sustainable and climate-resilient practices has AT LEAST the following characteristics: More than 50% of the cocoa farming area has co-planted shading plant species providing 30-50% shade to cocoa trees. AND, in case the farm is aged three years old or younger, more than 50% of cocoa trees are put under rescue irrigation during dry season. Under project activity scenario, the area of cocoa plantations under sustainable and climate resilient practices will increase. Thus:

$$SCR_{PROJ} \neq 0 \quad (6)$$

With SCR_{PROJ} = Area of cocoa plantations under sustainable and climate resilient practices when the project is implemented.

Option2: Adaptation activity scenario under option 2

- Adaptation activity scenario for Improved survival rate of cocoa saplings at farm establishment (% of planted saplings)

When project activity is applied, the survival rate of planted seedlings changes positively. The survival rate will be obtained using the formula below:

$$SR_{PROJ} = 100 * \frac{NS_{PROJ}}{N_{PROJ,COCOA,TOT}} \quad (7)$$

Where:

For:

SR_{PROJ} = Survival rate of young cocoa tree planted under project activity (% of planted saplings);

NS_{PROJ} = Number of surviving cocoa saplings three years after planting under project activity

$N_{PROJ,COCOA,TOT}$ = Number of cocoa saplings replanting despite the application of sustainable and climate-resilient practices.

- Adaptation activity scenario for enhanced productivity of cocoa farm (kg of cocoa beans/ha)

The promoted agroforestry systems include companion trees with height and density sufficient to provide 30-50% shade to mature cocoa trees. The lifespan of cocoa trees will be prolonged, allowing for the continuous production of cocoa beans on the same land for at least 60 years, as opposed to the 20-30 years typical of full sun monoculture [15,19,20]. Hence the cocoa farm production beyond 30 years of age is determined through the application of the following formula:

$$PROD_{PROJ(31-60)} = \sum_{t=31}^{60} PROD_{PROJ,t} \quad (8)$$

Where:

$PROD_{PROJ,t}$ = annual cocoa productions under sustainable agroforestry practices at ages t between 31 and 60 years old.

- Adaptation activity scenario for complementary farm output (kg/ha)

The agroforestry package promoted allows for the cocoa farm to provide diversified farm outputs that mitigate income fluctuations. Each farm output under project activity is determined using the formula below:

$$CO_{PROJ,t}(i) = V_{PROJ,t}(i) * P_{PROJ,t}(i) \quad (9)$$

For:

$CO_{PROJ,t}(i)$: farm output from specific crop i , on the period t , USD/ha;

$V_{PROJ,t}(i)$ economic value of crop i intercropped with cocoa on the period t , USD/kg;

$P_{PROJ,t}(i)$ = production of one crop i under project activity on the period t , Kg/ha. It strongly depends on the specific crop, climate, and the farm management practices; It can be pre-assessed using the tool “Ex-ante assessment of one crop production under sustainable agroforestry”.

$$tCO_{PROJ,t} = \sum_{i=1}^n CO_t(i) \quad (10)$$

Where:

$tCO_{PROJ,t}$ = Complementary farm output under project activity

2.4.4. Quantification of the Adaptation Benefits of the activity

1.1. Quantification of the Adaptation Benefits of the activity

For zone, the adaptation benefits are calculated per Option and indicator.

1.1.1. Quantification of the Adaptation Benefits for Option 1

Adaptation benefits are calculated as hectares of sustainable managed cocoa plantation after 3 years upon establishment of the farm and application of the sustainable agroforestry package of measures. The number of hectares of sustainably managed cocoa farms due to the project is calculated by subtracting the total area of such farms under the baseline scenario from that under the project activity.

$$SCR = SCR_{PROJ} - SCR_{BL} \quad (11)$$

Where:

SCR_{BL} = Cocoa plantation under sustainable and climate-resilient practices in baseline conditions (in hectare).

SCR_{PROJ} = Cocoa plantation under sustainable and climate-resilient practices in project scenario (in hectare).

SCR = Sustainably Managed Cocoa plantation (in hectare).

Since $SCR_{BL} = 0 \text{ ha}$,

We have: $SCR = SCR_{PROJ} - 0$

Giving:

$$SCR = SCR_{PROJ} \quad (12)$$

1.1.2. Quantification of the Adaptation Benefits for Option 2

In each area, adaptation benefits are calculated as the combined benefits per hectare of sustainably managed cocoa plantation after 7-10 years upon establishment of the farm and application of the sustainable agroforestry package of measures. The quantification is separate for each of the three indicators.

Quantification of improved survival rate of cocoa saplings at farm establishment

$$ISR = SR_{PROJ} - SR_{BL} \quad (13)$$

Where:

ISR = Improved survival rate of cocoa saplings at farm establishment.

SR_{PROJ} = Survival rate of cocoa farms under sustainable agroforestry, %

SR_{BL} = Survival rate of cocoa farms under baseline, %

Quantification of enhanced productivity of cocoa farm (kg of cocoa beans/ha)

$$PROD_{(31-60)} = PROD_{PROJ(31-60)} - PROD_{BL(31-60)} \quad (14)$$

$PROD_{(31-60)}$ = Gains from enhanced productivity of cocoa farming (kg/ha)

$PROD_{PROJ,t}$ = annual cocoa productions under sustainable agroforestry practices at ages t between 31 and 60 years old.

$PROD_{BL(31-60)}$ = production of cocoa farm aged between 31 and 60 years old under baseline condition (kg)

Quantification of complementary farm output (USD/ha)

$$CO_t = tCO_{PROJ,t} - tCO_{BL,t} \quad (15)$$

$CO_{PROJ,t}(i)$: complementary output from specific crop i , on the period t , USD/ha;



$CO_{BL,t}(i)$ = complementary output from specific plant species i under baseline on the period t in USD;

2.4.5. Adaptation Benefit issuance period

A sustainable cocoa farm typically operates for about 60 years, after which cocoa trees may need rejuvenation. Certified Adaptation Benefits (CABs) are issued to support the recovery of upfront investments made by the project to establish 3,000 ha climate-resilient cocoa agroforestry systems.

Farmers do not receive direct financial payments from CAB revenues. Instead, they benefit from in-kind support during the establishment phase, including training, planting materials, and irrigation equipment supported by the initial investment.

The value of CABs is mobilized at Year 3, reflecting the successful establishment of cocoa farms under climate-resilient practices and enabling the replenishment of the project's initial investment. A retention mechanism is applied at the project level, whereby 80% of CAB revenues are allocated to replenishing the investment used for the initial cohort, while the remaining 20% is retained and mobilized between Years 7 and 10, subject to verification of sustained agroforestry practices. This retained portion supports continued project activities and contributes to financing subsequent cohorts of farm establishment. This approach ensure that CAB revenues are directly linked to both the initial establishment and the sustained performance of climate-resilient agroforestry systems, thereby enabling a revolving and scalable adaptation financing model.

Table 4. Phase-wise AB forecast

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034		
Planting	10	10	0	0	0	500	1000	1500								
CABs					0	20			500	1000	1500					
Replenishment planting										500	1000	1500				
2nd round of CABs														500	1000	1500

Phase	Phase 1 (firs cohort of planting)								Phase 2 (second cohort of planting)							
Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034		
Planting (ha)	10	10	0	0	0	500	1000	1500								
CABs					0	20			500	1000	1500					
2nd cohort of planting										500	1000	1500				
2nd round of CABs													500	1000	1500	

1 CAB = 1 ha SCR

2.5. Monitoring Methodology

MRV data are collected using the Regreening Africa App by trained enumerators. Each monitored farm is assigned a unique ID, and data collection includes GPS coordinates, timestamps, and geotagged photographs. Data may be collected offline and uploaded once connectivity is available. Raw submissions in the application backend are preserved and not overwritten.

At defined monitoring and verification checkpoints, MRV datasets are exported from the application backend into structured Excel files for analysis and reporting. Each export constitutes a fixed dataset version, identified using a standardized naming convention. Exported datasets are stored in a centralized, access-controlled project repository in read-only format. Dataset versions are never overwritten or deleted.

To ensure data integrity, a cryptographic hash is generated for each exported Excel dataset and recorded in a dataset register together with the dataset name, version number, export date, and responsible staff member. Any subsequent modification to a dataset would result in a different hash value, enabling detection of data tampering. Verifiers may independently recompute hash values using archived datasets.

Data corrections are implemented exclusively through the creation of new dataset versions, with all changes documented in a correction log. Access to MRV datasets is restricted to authorized project personnel, while independent verifiers are granted read-only access to relevant dataset versions, metadata, and audit records at verification checkpoints. All MRV data and audit records are archived for the duration of the project.

2.5.1. First monitoring when cocoa trees are 3 years of age.

Monitoring of the AB “Cocoa plantation under sustainable and climate-resilient practices”

The baseline for the Adaptation Benefit “Cocoa plantations under sustainable and climate-resilient practices” is zero in both Vavoua and Soubré. The total area (in hectares) of cocoa plantations established under sustainable and climate-resilient practices will be monitored three years after the start of project activities.

As the project supports farmers on a one-hectare-per-farmer basis, the number of beneficiary farmers will be directly derived from the area measured during monitoring. This number of beneficiaries will be disaggregated by gender and age group (women, youth, and men).

In addition to beneficiary counting, the monitoring framework will capture these gender-ralted indicators:

- Number of women beneficiaries with successfully established cocoa farms;
- Hectares of cocoa farms with increased density of women-relevant agroforestry species

These indicators will be assessed through field verification and baseline comparison, complemented by community-based data collection and technical validation by project technicians.

2.5.2. Second monitoring, when cocoa trees are beyond 7 years of age.

Monitoring the AB “improved survival rate of cocoa saplings at farm establishment”

Monitoring “improved survival rate of cocoa saplings at farm establishment” consists in assessing $N_{BL, COCOA, TOT}$; $N_{PROJ, COCOA, TOT}$; NS_{BL} and NS_{PROJ}

Monitoring will be implemented through a community-based approach, with local farmers or extension agents trained to collect the required data. For 1,500 beneficiaries in each agroclimatic zone, this approach allows the project to monitor a statistically representative sample of 306 farms at an estimated cost of \$2 per farm. This allows for balancing statistical requirements, resource efficiency, and community engagement. Random sampling ensures that the farm-level survival rate is estimated with a 95% confidence level and a $\pm 5\%$ margin of error. Few spot checks and GPS-verified photos will be used by project technicians to validate community-collected data.

- Monitoring of the parameter $N_{BL, COCOA, TOT}$

$N_{BL, COCOA, TOT}$ refers to the total number of cocoa saplings planted per hectare under the baseline scenario, evaluated separately for the agro-climatic zones of Vavoua and Soubré. It will include the initial planting at establishment and the replanting of dead saplings. Each replanting will be recorded right after the first and second dry seasons.

This parameter will reflect the cumulative planting effort required to establish and maintain, during first three-years, a standard cocoa plantation under local baseline practices. It will serve as the reference point for comparing sapling survival and replanting needs under project activities.

$N_{BL, COCOA, TOT}$ will be determined as follows:

- At least four test plots of 0.5 ha will be established in each homogeneous agro-climatic zone.
- Local baseline cocoa planting practices will be applied, respecting the recommended spacing of 3 m \times 2.5 m.
- Dead saplings will be identified at the end of the first and second dry seasons (March–April).
- Losses will be replaced through replanting, and the number of replanted saplings will be recorded for each plot.
- The total number of saplings planted per hectare will be calculated as the sum of the initial planting and all replanting after the first and second dry seasons.

The monitoring approach described is to comply with that recommended by the applied methodology (Table 5).

Table 5: Monitoring of the parameter $N_{BL,COCOA,TOT}$

<i>Data / Parameter:</i>	$N_{BL,COCOA,TOT}$
<i>Data unit:</i>	<i>Unit of planted cocoa saplings per hectare</i>
<i>Description:</i>	<i>Assessment of the baseline number of cocoa saplings planted per hectare in new cocoa farms within each homogeneous agro-climatic zone, including both the initial planting and any replanting carried out after the first and second dry seasons.</i>
<i>Source of data:</i>	<p><i>Field tests in each homogeneous agroclimatic zone: A conservative assessment of baseline number of cocoa saplings planted per hectare in each agro-climatic zone.</i></p> <p><i>Conservative value for the costs can be derived from:</i></p> <ul style="list-style-type: none"> - <i>agronomy research database.</i> - <i>Plant growth model.</i> - <i>specialized tool in the appendix</i>
<i>Measurement procedures (if any):</i>	<p><i>Procedures for field tests:</i></p> <ul style="list-style-type: none"> • <i>Establish at least 4 plots in each homogeneous agro-climatic zone (e.g., 0.5–1 ha per plot).</i> • <i>Apply the local baseline cocoa planting practices with recommended spacing (3 m × 2.5 m)</i> • <i>At the end of the first and second dry seasons (March–April), identify dead sapling</i> • <i>replant to replace losses and record the number of replanted seedlings for each plot.</i> • <i>Calculate the total number of seedlings planted per hectare as the sum of the initial planting and all replanting after the first and second dry seasons.</i> <p><i>In case there are too many agroclimatic zones, application of the tool “Assessment of the number of cocoa trees (re)planted at cocoa farms establishment under baseline” may be considered to reduce monitoring cost.</i></p>
<i>Monitoring frequency:</i>	<i>3 years</i>
<i>QA/QC procedures:</i>	
<i>Any comment:</i>	<i>Conservative value can be used following local context</i>

- Monitoring of the parameter NS_{BL}

NS_{BL} is the number of cocoa saplings that survive three years after planting under the baseline scenario, evaluated separately for the agro-climatic zones of Vavoua and Soubré. It includes the cocoa saplings, for each 05-hectare test plots, that remain alive after the first three dry



seasons. Each surviving sapling will be recorded at the end of the third dry season. From the above test plots established under local farmers' practices, the monitoring of NS_{BL} will be done by counting and recording the number of surviving cocoa saplings in each plot.

Table 6: Monitoring of the parameter NS_{BL}

<i>Data / Parameter:</i>	NS_{BL}
<i>Data unit:</i>	<i>saplings</i>
<i>Description:</i>	<i>Number of surviving cocoa saplings three years after planting under baseline scenario. This number depends on the cocoa variety and local climate conditions. It is expressed in number of surviving saplings per hectare</i>
<i>Source of data:</i>	<p><i>Field test in each homogeneous agroclimatic zone: A conservative assessment of surviving saplings from field test plots established in each agro-climatic zone.</i></p> <p><i>If necessary other sources may be used such as:</i></p> <ul style="list-style-type: none"> - <i>agronomy research database.</i> - <i>Plant growth model.</i> -
<i>Measurement procedures (if any):</i>	<p><i>Field Test in Each Homogeneous Agro-Climatic Zone</i></p> <ol style="list-style-type: none"> <i>1. Plot Establishment</i> <ul style="list-style-type: none"> ○ <i>Establish four test plots of 0.5-1 hectare each in every homogeneous agro-climatic zone.</i> ○ <i>Apply local baseline cocoa plantation practices in each plot.</i> ○ <i>Ensure that cocoa trees are planted according to the recommended spacing of 3 m × 2.5 m.</i> <i>2. Monitoring During Initial Dry Seasons</i> <ul style="list-style-type: none"> ○ <i>At the end of the first and second dry seasons (March–April), record the number of cocoa saplings that died.</i> ○ <i>Replant all dead saplings in the optimum period after counting.</i> <i>3. Survival Assessment</i> <ul style="list-style-type: none"> ○ <i>At the end of the third dry season (March–April), count and record the number of surviving cocoa saplings in each plot.</i>
<i>Monitoring frequency:</i>	<i>During the initial three years of the farm establishment</i>
<i>QA/QC procedures:</i>	- <i>Ensure homogeneity of climate in the agroclimatic zone</i>

	<ul style="list-style-type: none"> - <i>Follow standardized protocol including the same planting schedule and the same practices as BAU</i> - <i>Ensure that every planting and replanting event is accurately documented, verifiable, and traceable</i> - <i>Check and prevent double counting of surviving saplings at the end of the third year</i>
<i>Any comment:</i>	

- Monitoring of the parameter $N_{PROJ,COCOA,TOT}$

$N_{PROJ,COCOA,TOT}$ accounts for the total number of cocoa saplings planted per hectare under the project activity scenario (unit of planted cocoa saplings/hectare). Each agroclimatic zone has its separate $N_{PROJ,COCOA,TOT}$. This includes both number of planted saplings after the initial planting operation and all those after the replanting of dead saplings. They are recorded after the first and second dry seasons. This will reflect the planting effort required to establish and maintain cocoa farms when project-supported adaptation measures are applied. The measurement will be done as per the dedicated monitoring approach described in the table 7.

$N_{PROJ,COCOA,TOT}$ will be determined as follows:

- A representative sample of farms under project activity will be selected (depending on the number of beneficiaries), using random sampling in both Vavoua and Soubre.
- The project's adaptation measures applied by farmers will be documented.
- The number of seedlings initially planted per plot will be recorded, along with the planting date and seedling source.
- The number and date of replanted seedlings will be recorded. GPS coordinates and photos of replanting will be collected to support verification.
- The total number of seedlings planted per hectare will be calculated as the sum of the initial planting and the replanting carried out after the first and second dry seasons.

Table 7: Monitoring of the parameter $N_{PROJ, COCOA, TOT}$

<i>Data / Parameter:</i>	$N_{PROJ, COCOA, TOT}$
<i>Data unit:</i>	<i>Unit of planted cocoa saplings per hectare</i>
<i>Description:</i>	<i>Assessment of the total number of cocoa saplings (re)planted at farm establishment under project activity</i>
<i>Source of data:</i>	<i>Field sampling using a statistically robust protocol</i>
<i>Measurement procedures (if any):</i>	<p><i>Sampling is conducted annually for each agroclimatic zone. Within the same zone, the result is the cumulative count of cocoa sapling plantings or replantings.</i></p> <ul style="list-style-type: none"> • <i>Select a representative sample of farms (depending on the number of beneficiaries) where farmers applied the adaptation measures - using random or stratified sampling in each agro-climatic zone</i> • <i>Document the adaptation measures applied by the farmer</i> • <i>Record the number of seedlings planted initially per plot by the farmer, along with the planting date and seedling source.</i> • <i>Record the number and date of replanted seedlings</i> • <i>Calculate the total number of seedlings planted per hectare as the sum of the initial planting and the replanting carried out after the first and second dry seasons.</i>
<i>Monitoring frequency:</i>	<i>At the end of each dry season, during the initial 3 years of cocoa farm establishment.</i>
<i>QA/QC procedures:</i>	<ul style="list-style-type: none"> - <i>Use standardized forms or mobile apps for farmer reports or enumerator verification.</i> - <i>Supervisors randomly verify 5–10% of farms by visiting plots to confirm planting counts and adaptation measures applied.</i> - <i>Use GPS and photos for verification.</i>
<i>Any comment:</i>	



- Monitoring of the parameter NS_{PROJ}

During the same field survey conducted for $N_{PROJ,COCA,TOT}$, an evaluation will be done for NS_{PROJ} . This parameter will represent the number of cocoa saplings that survive three years after planting on farms where project-supported adaptation measures have been applied. The surviving saplings on each selected farm will be counted and recorded to assess sapling survival under project activities. In each agro-climatic zone, the assessment will follow the same schedule used for $N_{PROJ,COCA,TOT}$. It will comply with the content of table 8.

Table 8: Monitoring of the parameter NS_{PROJ}

<i>Data / Parameter:</i>	NS_{PROJ}
<i>Data unit:</i>	<i>saplings</i>
<i>Description:</i>	<i>Number of surviving cocoa saplings three years after planting under activity scenario. It is expressed in number of surviving saplings per hectare</i>
<i>Source of data:</i>	Field data collection from farmers' fields
<i>Measurement procedures (if any):</i>	Survey: <ul style="list-style-type: none"> - recommend and document the same project activity in the fields for each agroclimatic zone - Define the population: e.g. all farmers participating in the project - Select a representative sample of farmers based on the number of beneficiaries - conduct surveys at the end of the dry seasons after planting to record survival data per plot or farm in standardized forms (during the first three years after planting).
<i>Monitoring frequency:</i>	During the initial three years of the farm establishment
<i>QA/QC procedures:</i>	<i>Survey must be done following a standardized protocol</i> <i>Follow the same schedule as baseline</i>
<i>Any comment:</i>	



Monitoring the AB “Enhanced productivity of cocoa farming”

Monitoring “Enhanced productivity of cocoa farming” involves the assessment of both $PROD_{BL(31-60)}$ and $PROD_{PROJ,t}$

Where:

$PROD_{BL(31-60)}$ = production of cocoa farm aged between 31 and 60 years old under baseline condition (kg)

$PROD_{PROJ,t}$ = annual cocoa productions under sustainable agroforestry practices at ages t between 31 and 60 years old.

- Monitoring of the parameter $PROD_{BL(31-60)}$

The monitoring of $PROD_{BL(31-60)}$ is done by primarily assess the shade cover of the farms in absence of project activity. As current shade cover in both areas is close to the full sun monoculture with less than 13% [21], $PROD_{BL(31-60)}$ is zero kg/ha.

- Monitoring of the parameter $PROD_{PROJ,t}$

As per table 8, an ex-ante assessment will be used for $PROD_{PROJ,t}$, the annual cocoa production under sustainable agroforestry practices at ages between 31 and 60 years old. For each agroclimatic zone the cocoa tree density is identical. A record will be created for all companion tree species, heights and crown diameter of adult stage, lifespans, and planting densities. Based on this information an estimate of the future shade cover based will be calculated. The result of the shade will be used to verify that the shade will be in the range of the optimum 30-50%. Upon the verification that shade cover is well in the range 30-50% range, the value of $PROD_{PROJ,t}$ will be set equal to the minimum yield of aged cocoa farms under agroforestry. As this minimum yield of aged cocoa farms is site specific, it will be assessed through the tool " Ex-ante assessment of cocoa production under sustainable agroforestry measure at ages after 30 years old".

Table 9: Monitoring of the parameter $PROD_{PROJ,t}$

<i>Data / Parameter:</i>	$PROD_{PROJ,t}$
<i>Data unit:</i>	kg/ha
<i>Description:</i>	<i>Annual cocoa production under sustainable agroforestry practices at ages t between 31 and 60 years old.</i>
<i>Source of data:</i>	- <i>Estimation of the minimum value based on the shade cover of the established agroforestry system.</i>
<i>Measurement procedures (if any):</i>	<p><i>The measurement is an ex-ante assessment. It is done in three main steps</i></p> <ul style="list-style-type: none"> - <i>Record cocoa tree density.</i> - <i>Note the name of companion tree species, heights and crown diameter of adult stage, lifespans, and planting densities.</i> - <i>estimate the future shade cover based on actual tree density and species</i> - <i>verify that the shade will be in the range of the optimum 30-50%</i> <p><i>Set $PROD_{PROJ,t}$ equal to the minimum yield of aged cocoa farms under agroforestry. This minimum yield of aged cocoa farms may be estimated through literature or through the tool "Ex-ante assessment of cocoa production under sustainable agroforestry measure at ages after 30 years old"</i></p> <p>-</p>
<i>Monitoring frequency:</i>	<i>7-10 years (pre-assessment)</i>
<i>QA/QC procedures:</i>	
<i>Any comment:</i>	<i>In case of actual measurement (not an ex-ante assessment), GIS and AI tools may be used to reduce monitoring cost in large project areas</i>

Monitoring of the AB “Complementary farm output”

Monitoring “Complementary farm output” consist in assessing $P_{BL, t}$; $P_{PROJ, t}$; $V_{BL, t}$; and $V_{PROJ, t}$

Where:

$P_{BL, t}(i)$ = production of plant i (in kg) under baseline on the period t .

$P_{PROJ, t}(i)$ = production of one crop i under project activity on the period t , Kg/ha.

$V_{BL, t}(i)$ = economic value of plant i on the period t ; expressed in USD/kg;

$V_{PROJ, t}(i)$ economic value of crop i intercropped with cocoa on the period t , USD/kg;

- Assessment of $P_{BL, t}$

The monitoring of Baseline production of each plant species of the farm will be done as per Table 10.

Table 10: monitoring of baseline production of each plant species of the farm ($P_{BL, t}$)

<i>Data / Parameter:</i>	$P_{BL, t}$
<i>Data unit:</i>	kg/ha
<i>Description:</i>	<i>Baseline production of each plant species of the farm</i>
<i>Source of data:</i>	<i>Data sources include field measurements, peer-reviewed agronomic datasets, national statistics, and model inputs (climate, soil, crop parameters) from recognized database.</i>
<i>Measurement procedures (if any):</i>	<ol style="list-style-type: none"> 1- <i>Identify species that are associated to cocoa by default in baseline, If baseline is pure monoculture, then $P_{BL, t} = 0$ kg/ha</i> 2- <i>In case baseline isn't pure monoculture, select representative farms across the project area using stratified random sampling</i> 3- <i>collect farmer-reported yields (last 3–5 years) for each non-cocoa species and triangulate with agricultural statistics</i> 4- <i>Establish the conservative baseline yield as the mean of observed yields for each species.</i>
<i>Monitoring frequency:</i>	7-10 years
<i>QA/QC procedures:</i>	<ul style="list-style-type: none"> - <i>Define a clear rule for what qualifies as an “associated crop” and apply it consistently across all farms</i> - <i>Ensure sample size provides at least 95% confidence level with acceptable margin of error</i>
<i>Any comment:</i>	<i>It depends on the specific plant, local climate, soil and the farm management practice</i>



Table 11: Monitoring $P_{PROJ, t}$

<i>Data / Parameter:</i>	$P_{PROJ, t}$
<i>Data unit:</i>	kg/ha
<i>Description:</i>	<i>Production of each non-cocoa crop of the farm under project activity on the period t</i>
<i>Source of data:</i>	<i>Field survey, Agronomy research database, and estimation using the tool “Ex-ante assessment of one crop production under sustainable agroforestry”</i>
<i>Measurement procedures (if any):</i>	<p><i>Conservative value should be utilized, including long-term average production per hectare</i></p> <p><i>Field survey:</i></p> <ul style="list-style-type: none"> - <i>Record any plant species introduced by the project in the cocoa farms that provide complementary farm output</i> - <i>Select representative farms using stratified random sampling by farm size, agroecological zone, and management type.</i> - <i>collect farmer-reported yields (last 3–5 years) and triangulate with agricultural statistics</i> - <i>Establish the current conservative value of $P_{PROJ, t}$ as the mean of observed yields for each crop.</i> - <i>Estimate future Yields:</i> <ul style="list-style-type: none"> o <i>Option 1: Apply an agronomic or crop growth modeling tool to project yields over time under the project interventions.</i> o <i>Option 2 (if modeling is not feasible): Use the minimum observed yield over past years as a conservative estimate of future yield.</i>
<i>Monitoring frequency:</i>	<p><i>Yearly, during the period 7 to 10 years after planting.</i></p> <p><i>Conservative estimate is used for the period beyond 10 years after planting</i></p>
<i>QA/QC procedures:</i>	<p><i>Define a clear rule for what qualifies as an “associated crop” and apply it consistently across all farms</i></p> <p><i>Ensure sample size provides at least 95% confidence level</i></p>
<i>Any comment:</i>	<i>It strongly depends on the specific crop, weather, and the farm management practices</i>

Table 12: Monitoring $V_{BL, t}$

<i>Data / Parameter:</i>	$V_{BL, t}$
<i>Data unit:</i>	USD/kg
<i>Description:</i>	Market price of each crop of the farm under baseline on the period t
<i>Source of data:</i>	Market price records / Surveys
<i>Measurement procedures (if any):</i>	<ul style="list-style-type: none"> - Identify all non-cocoa crops in the baseline (If any) - Collect seasonal averages of price per crop - or use official agricultural statistics
<i>Monitoring frequency:</i>	Yearly
<i>QA/QC procedures:</i>	Ensure that statistics come from recognized, reliable institutions (government agencies, FAO, research centers).
<i>Any comment:</i>	

Table 13: Monitoring $V_{PROJ, t}$

<i>Data / Parameter:</i>	$V_{PROJ, t}$
<i>Data unit:</i>	USD/kg
<i>Description:</i>	Market price of each crop of the farm under project activity on the period t
<i>Source of data:</i>	Market prices / Agricultural Surveys
<i>Measurement procedures (if any):</i>	<ul style="list-style-type: none"> - Identify all non-cocoa crops (e.g., plantain, cassava, maize, fruit trees, timber, etc.). - Collect seasonal averages of price per crop - or use official agricultural statistics
<i>Monitoring frequency:</i>	Yearly
<i>QA/QC procedures:</i>	Document price sources for transparency.
<i>Any comment:</i>	

2.5.3. Monitoring summary

Table 14: Summarized monitoring matrix

Indicator	Type	Responsible Entity	Data Collection Frequency	Data Source / Means of Verification	Reporting Timeline
Area of cocoa plantations under sustainable and climate-resilient practices	CAB (Option 1)	Project MRV Unit / Field technicians	At Year 3 (key monitoring milestone)	GPS mapping; field verification reports; farm registry; photos	CAB monitoring report (Year 3)
Number of beneficiary farmers (disaggregated)	CAB/ Gender (Option 1 and 2)	Project MRV Unit	At Year 3	Beneficiary registry	CAB monitoring report (Year 3)
Area of cocoa farms with increased density of women-relevant agroforestry tree species	CAB / Gender (Option 1 and 2)	Field technicians	At Year 3	Agroforestry model applied by farmers; field validation	CAB monitoring report (Year 3)
Survival rate of cocoa saplings at farm establishment (post-year 7 assessment)	CAB (Option 2)	MRV Unit / Community enumerators / Field technicians	At Year 7 monitoring round	Sample farm surveys; GPS-verified field observations; replanting records	CAB monitoring report (Year 7)
cocoa production under sustainable agroforestry practices at ages t between 31 and 60 years old (kg/ha)	CAB (Option 2)	Field technician, Agronomy research, and modelling specialist	Pre-assessment (Year 7–10)	Shade assessment; farm inventories; agronomic modelling tools; literature-based yield functions	CAB monitoring report (Year 7–10)

Indicator	Type	Responsible Entity	Data Collection Frequency	Data Source / Means of Verification	Reporting Timeline
Production of each non-cocoa crop of the farm under project activity	CAB (Option 2)	Field technician, Agronomy research, and modelling specialist	Pre-assessment (Year 7–10)	Field surveys; farmers' statistics; agronomy databases	CAB monitoring report (Year 7–10)

2.5.4. Gender and inclusion monitoring

In addition to activity-results monitoring, gender and inclusion co-benefits will be tracked. Key indicators include the percentage of women and youth among trained beneficiaries and the percentage of women and youth who have successfully established their own resilient cocoa farms using the project's adaptation measures. The hectares of farms with increased tree species with economic value for women is also monitored. These indicators are collected during the regular monitoring cycles (Year 3 and Year 7–10) by trained enumerators, with verification by the MRV team. This approach ensures that key gender-responsive co-benefits are documented alongside field-level adaptation outcomes.

2.5.5. Monitoring of deforestation and leakage

As a prerequisite for receiving project inputs, including planting materials, irrigation equipments, and other assistance, farmers submit the GPS boundaries of their farms following a training session on accurate georeferencing. The shapefile of enrolled parcels will be overlaid on the map of protected areas, and any parcels falling within protected zones are excluded from project support. For the remaining farmers, annual leakage screening is performed using remote-sensing imagery to detect any unauthorized clearing or expansion. In addition, all participating farmers sign no-expansion/no-deforestation agreements. Non-compliance triggers attrition from the project.

2.5.6. Project deviation and attrition management

Project deviations and attrition are managed through the monitoring system:

- Deviation will be declared when monitoring observations during a monitoring cycle indicate a temporary or partial shortfall in expected adaptation outcomes, such as reduced shade tree survival, reduced farm area, etc. This is identified through monitoring or sampled verification. They are recorded in the project registry, together with the observed cause and supporting evidence. In case deviations are resolved in subsequent monitoring cycles, farms remain eligible for CAB issuance.
- Attrition will be declared where monitoring confirms permanent loss of eligibility, including abandonment of the farm or deliberate removal of shade trees and non-compliance to the no-deforestation agreement. In this case, CAB issuance is adjusted accordingly, including reduction, non-issuance, or clawback, in line with the project's clawback mechanism. In other words, attrition results in a reduction of eligible area and associated CAB issuance for the affected monitoring period and all subsequent periods.

Replacement of plots, where applicable, does not increase the total CAB quantity beyond the originally registered eligible area and serves only to maintain implementation continuity.

2.5.7. Fire risk prevention and community fire management

To reduce the risk of accidental fire affecting cocoa plots and associated shade trees, the project applies a fire-prevention and community fire-management SOP.

As part of capacity-building activities, participating farmers are trained on basic fire-prevention practices, including establishment and maintenance of fire-breaks around cocoa plots at the onset of the dry season and safe land-preparation practices.

At community level, farmers are sensitized to collective fire-management practices, including coordinated burning calendars where relevant, prohibition of uncontrolled fires near project plots, and prompt reporting of fire incidents.

Fire-break presence and signs of fire damage are checked during regular field monitoring visits. Any fire-related incidents are recorded, and affected plots are assessed under the project's deviation and attrition procedures.

2.6. Operational parameters for Baseline definition, uncertainty adjustment, and CAB issuance

The table below defines the numeric baseline parameters, conservative adjustment rules, and CAB issuance thresholds used for monitoring and verification purposes. These parameters operationalize the baseline scenario and ensure conservative and verifiable estimation of adaptation benefits.

Table 15: MRV and CAB Issuance Parameters

Element	Numeric definition	Rule / value	Purpose
Baseline shade cover	≤13% (literature-based)	Business-as-usual cocoa systems for adult cocoa trees	Reference point
Baseline survival rate	<30% (ICRAF field-based estimates in multi-site trials)	Survival rate at cocoa establishment under business-as-usual conditions	Reference point
Conservative adjustment factor (establishment & adult stages)	-5% applied to observed survival and shade indicators	Applied to field-based monitoring results	Avoid overestimation due to measurement and sampling uncertainty
Contingency buffer (establishment uncertainty)	10–15% allowance in expected	Applied in interpretation of survival-to-hectare conversion	Absorb implementation variability, farmer

Element	Numeric definition	Rule / value	Purpose
	establishment outcomes	(classification of successfully established farms)	performance differences
CAB issuance threshold (cocoa survival rate – establishment phase)	≥80% at year 3	Survival rate of young cocoa trees required for a cocoa farm to be considered successfully established	Issuance rule
CAB issuance threshold (shade cover – mature system)	30–50% (7–10 years after planting)	Agroforestry target range for climate resilience of adult cocoa trees	Issuance rule

The number of Certified Adaptation Benefits (CAB) relies on a set of key biophysical and climate-sensitive parameters. Given the inherent variability in climatic conditions and cocoa production systems in the regions, as well as the increasing uncertainty associated with future climate change, uncertainty bounds have been defined for key parameters. These bounds presented in the table below are grounded in observed historical variability and informed by scientific literature, climate projections, and field observations.

Table 16: Uncertainty ranges and supporting data sources for key CAB parameters

Parameter	Definition	Descriptive baselines	Uncertainty Range	Justification Logic	Source
Rainfall variability	Inter-annual and seasonal rainfall affecting cocoa yield	Zone specific rainfall variability	±9–20%, based on historical variability and expected increase in climate variability under future climate scenarios.	Cocoa yields are highly sensitive to rainfall distribution and intra-seasonal variability	Historical meteorological data in Côte d'Ivoire
Temperature impact on yield	Effect of mean temperature increase on cocoa productivity	Historical mean temperature per zone	+1°C to +2.5°C scenario range	Cocoa productivity declines under higher temperature stress; nonlinear response observed	Schroth et al. (2016), DOI: 10.1016/j.scitotenv.2016.03.024
Young cocoa tree survival rate	Proportion of cocoa seedlings surviving after establishment period (12–24 months)	~18–45% depending on local conditions and the year (typical smallholder establishment conditions)	20–90% depending on climate stress and management	Early-stage cocoa is highly sensitive to rainfall variability, heat stress, and seed source quality; survival strongly determines long-term productivity	ICRAF empirical data (Field data collected in cocoa production areas of Côte d'Ivoire including: Soubre, Vavoua, Sinfra, and Tiassalé)
Yield response to climate variability	Percentage change in cocoa yield due to climate fluctuations	Baseline farm yield which is estimated to 550 kg/ha in Côte d'Ivoire	±15–30% yield variability	Empirical studies show strong yield fluctuations driven by climate and farm conditions	Wessel & Quist-Wessel (2015), DOI: 10.1016/j.njas.2015.09.001

2.7. Contributions to SDGs and other public/private sectors Goals

The contributions of the Adaptation Benefits (ABs) to the Sustainable Development Goals (SDGs) will be reported in Table 17. The links between the ABs and the SDGs will be established based on the Global Indicator Framework for the SDGs and Targets of the 2030 Agenda for Sustainable Development. In addition, the goals of the World Cocoa Foundation (WCF) and the targets of Côte d'Ivoire's Nationally Determined Contributions (NDCs) for the sustainability of the cocoa sector will also be considered in mapping the ABs.

Table 17: Contribution to SDGs, World Cocoa Foundation Goals, and Country NDCs

Adaptation Benefits	SDG	WCF Goals	TARGETS OF CÔTE D'IVOIRE NDCs
Reduced cost farm establishment	SDG 1, SDG 2, and 1 SDG 3	WCF Goals 1: Prosperous cocoa farmers	Improved crop productivity
Enhanced productivity of cocoa farming	SDG 2		Improved crop productivity
Complementary farm outputs	SDG 13 SDG 5	WCF Goals 1: Prosperous cocoa farmers	Improved crop productivity & food security

3. Risk management.

3.1. Identified risks

The following risks in Table 18 are to be considered in Vavoua and Soubre.

Table 18: Risks, impact, and mitigation measures

Activity Component	Risk	Risk Category	Likelihood	Impact on Benefits	Overall Risk Level	Mitigation Measures
Farmers training on agroforestry and rescue irrigation	The training may be too technical or too short for participants to fully grasp key practices	Educational	Medium	High	High	Deliver training through integrated theoretical lessons and on-farm practical exercises. Use local language and visual aids.
	Women farmers may be underrepresented due to cultural or time constraints.	Gender	Medium	Medium	Medium	Apply gender-sensitive selection criteria; schedule sessions compatible with women's availability; ensure female facilitators are involved.
	Delays in organizing trainings before the rainy season can limit farmers' ability to plan and implement field operations on time.	Operational	Medium	High	Medium	Plan and confirm training logistics well in advance of the rainy season. Maintain a buffer in scheduling
Planting material dissemination	Delays in delivery planting material	Operational	Medium	Medium	Medium	Plan timely procurement and distribution

Activity Component	Risk	Risk Category	Likelihood	Impact on Benefits	Overall Risk Level	Mitigation Measures
Post-establishment farm maintenance	Field fire during dry season destroying plantations under sustainable and resilient practices	Environmental	Medium	High	High	Train farmers on fire prevention and control; establish firebreaks around farm sites;
	Farm destruction by CSSV (Cacao Swollen Shoot Virus) outbreak	Biological	Medium	High	High	Incorporate CSSV prevention and early detection measures into the training sessions.
	Illegal logging in surrounding areas reducing seed source and landscape integrity	Environmental	Medium	Medium	Medium	Collaborate with forestry authorities and local committees to monitor forest activities; raise awareness on sustainable resource use.

3.2. Risk monitoring

The risks should be monitored as per Table 19 below

Table 19: Environmental and Social Monitoring Plan

Activity Component	Risk	Mitigation Measures	Monitoring Indicators / Means of Verification	Frequency	Responsible Party	Estimated Cost (USD)	Documentation & Residual Risk Handling	Trigger & Response Logic
Farmers training on agroforestry and rescue irrigation	Training may be too technical or too short for participants to fully grasp key practices	Deliver training through integrated theoretical lessons and on-farm practical exercises; use local language and visual aids.	% of farmers correctly applying techniques; field reports, photos, participant feedback	After each training	CIFOR-ICRAF training team; ANADER	No additional budget required as this is drawn from ordinary training and M&E reports	Attendance and feedback forms archived; summary in quarterly reports.	Trigger: <70% correct practice adoption in field checks → Response: refresher training + field coaching within 1 month → Escalation: revise training module if repeated failure occurs
	Women farmers may be underrepresented due to cultural or time constraints	Apply gender-sensitive selection criteria; schedule sessions compatible with women's availability; involve female facilitators.	% of women among trainees; attendance lists disaggregated by sex	Each training session	CIFOR-ICRAF Gender focal point; cooperatives	No specific budget required as it is drawn from training reports	Gender data tracked in M&E dashboard; actions discussed at review meetings.	Trigger: women participation <30% → Response: adjust mobilization + targeted outreach → Escalation: review with gender focal point and cooperatives

Activity Component	Risk	Mitigation Measures	Monitoring Indicators / Means of Verification	Frequency	Responsible Party	Estimated Cost (USD)	Documentation & Residual Risk Handling	Trigger & Response Logic
	Delays in organizing trainings before the rainy season	Plan logistics in advance; maintain a scheduling buffer.	Training calendar validated; mission reports	Annually (pre-rainy season)	CIFOR-ICRAF coordination team	No specific budget required	Schedule compliance monitored; issues discussed quarterly.	Trigger: training delayed beyond seasonal window → Response: emergency accelerated training schedule → Escalation: adjust annual implementation plan
Planting material dissemination	Delays in delivery of planting material	Plan timely procurement and distribution.	% of materials delivered before planting season; delivery reports	Annually	CIFOR-ICRAF procurement officer; cooperatives	No specific budget required	Procurement delays documented; lessons integrated in next cycle.	Trigger: delivery delay >2 weeks before planting season → Response: activate alternative suppliers/nurseries → Escalation: adjust procurement framework contract
Farm establishment	Expansion of farms into forest areas	planting only on old cocoa farms that were destroyed and not located in protected areas; apply biodiversity-friendly agroforestry designs.	% of planting sites with GPS coordinates confirmed to be outside protected areas; # of species included in the recommended agroforestry design	At the field activity initiation	Project implementation team	No specific budget required as GPS coordinates will be drawn from the monitoring data; Agroforestry design is provided by	Encroachment of protected forest documented in the monitoring report; Corresponding farmers are removed from beneficiaries	Trigger: farm located in protected/illegal zone → Response: immediate exclusion from beneficiary list → Escalation: report to Cocoa Council and forestry authority

Activity Component	Risk	Mitigation Measures	Monitoring Indicators / Means of Verification	Frequency	Responsible Party	Estimated Cost (USD)	Documentation & Residual Risk Handling	Trigger & Response Logic
						CIFOR-ICRAF		
Post-establishment farm maintenance	Field fire during dry season destroying plantations	Train farmers on fire prevention; establish firebreaks.	Number of farms with firebreaks; # of fire incidents	Annually (dry season)	CIFOR-ICRAF technicians; cooperatives	No specific budget will be needed as the module will be included in the initial farmers' training sessions	Incidents recorded in logbooks; summary shared with safeguard officer.	Trigger: fire incident detected in zone → Response: emergency response + replanting support → Escalation: review fire prevention protocol
Post-establishment farm maintenance	Farm destruction by CSSV (Cacao Swollen Shoot Virus)	Integrate CSSV prevention and detection into trainings.	% of farms inspected for CSSV; inspection forms	Bi-annually	ANADER; cooperatives	1,500 per agroclimatic zone	Cases and responses documented; shared with ABM-EC and stakeholders	Trigger: confirmed CSSV case cluster → Response: remove infected plants + replanting support → Escalation: notify Cocoa Council for coordinated response

Activity Component	Risk	Mitigation Measures	Monitoring Indicators / Means of Verification	Frequency	Responsible Party	Estimated Cost (USD)	Documentation & Residual Risk Handling	Trigger & Response Logic
Post-establishment farm maintenance	Illegal logging reducing seed sources and landscape integrity	Provision of the forest code No. 2019-675) regarding tree ownership applies as per section 3.2 below	# of awareness sessions; # of reported incidents	annually	CIFOR-ICRAF safeguard focal point; local forestry authorities	1500 per agroclimatic zone	Reports consolidated in safeguard monitoring; unresolved issues escalated.	Trigger: repeated illegal logging incidents → Response: community sensitization + enforcement escalation → Escalation: report to forestry authority
Pollution, including from chemicals and waste	Minor pollution risk from	Promoting organic soil amendments and Integrated Pest Management (IPM). Integrate a module of training in the training session	# of farmers trained in Organic soil management and IPM	During initial farmer training sessions	CIFOR-ICRAF safeguard focal point	No specific budget other than the budget of the initial budget is required	Reports consolidated in safeguard monitoring	Trigger: misuse of agrochemicals detected → Response: retraining + field correction
Water management	Temporary water competition	Providing water storage tanks and training farmers on efficient water use/irrigation practices.	# of farmers with tanks #Number of farmers trained on efficient water use	At the field activity initiation	CIFOR-ICRAF	120	Report consolidated in safeguard monitoring	Trigger: water competition reported in zone → Response: deploy additional storage support + irrigation guidance

Activity Component	Risk	Mitigation Measures	Monitoring Indicators / Means of Verification	Frequency	Responsible Party	Estimated Cost (USD)	Documentation & Residual Risk Handling	Trigger & Response Logic
Social Inclusion	Unequal access of women to project benefits, resources, or financing opportunities.	Protocol to prioritize women beneficiaries in each project area.	Percentage of women beneficiaries in each area	During beneficiaries selection	CIFOR-ICRAF safeguard focal point; Cooperatives	This measure doesn't require separate budget	Project report presenting the women and men beneficiaries	Trigger: women below target threshold → Response: adjust selection criteria + targeted outreach

3.3. Specific case of water related risks

In accordance with the methodology requirements for assessing and mitigating water-related maladaptation risks, the project applies a structured, risk-based water management framework covering demand, sourcing, storage, and monitoring.

Supplementary irrigation in Soubré and Vavoua will be limited to dry-season “rescue irrigation” for young cocoa trees (0–3 years), applied only during defined climatic stress events. Water demands for such irrigation practice are estimated at 2–6 L per sapling per dry season (up to 8 L under extreme conditions), corresponding to approximately 2,000–2,400 L/ha, with a conservative value of 3,773 L/ha.

Water supply is based primarily on rainwater harvesting, with farmers equipped with 2,000–4,000 L storage tanks collecting rooftop runoff during the rainy season. Given annual rainfall above 1,200 mm, harvested volumes are sufficient to fill tanks multiple times per season, significantly reducing or eliminating dependence on surface or groundwater abstraction. A typical 12 m² rooftop generates approximately 11,500–14,400 L/year, supporting repeated tank recharge under realistic conditions.

Rainwater is considered a low-risk irrigation source in the rural project context, supported by evidence from Côte d’Ivoire (Kassamba-Diaby et al., 2023) showing slightly acidic pH (5.3–5.8) and low electrical conductivity, with chemistry driven mainly by natural atmospheric deposition (dust and biomass-burning aerosols). Although mildly acidic, rainwater is agronomically suitable for low-volume irrigation and is rapidly buffered in soil.

A two-stage monitoring will be implemented to ensure proper irrigation practice. First, rainy-season monitoring will verify that all participating farmers adequately fill their storage tanks. Second, dry-season monitoring will assess actual irrigation application and ensure that rescue irrigation (2–6 L per sapling) is implemented only during prescribed periods of severe water stress, in line with the technical guidelines.

Overall, the system ensures low-volume, rainwater-based, climate event-driven irrigation, fully consistent with the methodology and designed to avoid unsustainable abstraction and water-use conflicts.



3.4. Specific case of tree tenure uncertainty and unauthorized harvesting.

As tree ownership is determining to the integrity of the CABs, the project applies Article 27 of Côte d'Ivoire Forestry Code No. 2019-675, which recognizes ownership of planted trees by the planter. Tree ownership under the project is documented through a consolidated Tree-Tenure Registry listing participating farmers who have planted trees, together with their plot IDs, GPS boundaries, and planting dates, as verified through the MRV system.

The registry is established following the first MRV reporting cycle (Year 3) and is formally notarized as a single legal document. It serves as legally recognized evidence of tree ownership for participating farmers and supports enforcement against unauthorized cutting or exploitation by third parties. The structure and content of the registry are provided in Annex 1 (Tree-Tenure Registry Template).

3.5. Management of all residual risks

Based on the monitoring report, all residual risks will be recorded in cooperative and project logbooks, reviewed quarterly, and summarized in annual safeguard reports. Residual risks that remain after mitigation measures have been implemented and are considered acceptable if they are unlikely to materially affect project's CABs, the environment, or stakeholder well-being. Examples include minor delays in training sessions or limited tree mortality (<5%) that do not compromise overall farm productivity. All residual and emerging risks will be systematically recorded in safeguard monitoring logbooks maintained by cooperatives and CIFOR-ICRAF field teams, including a description of the risk, mitigation measures applied, status, and likelihood of impact. Risks will be reviewed and updated quarterly or annually to reflect evolving project conditions, with CIFOR-ICRAF safeguard focal points responsible for consolidating updates and reporting. Emerging risks identified during field monitoring, stakeholder consultations, or through the grievance redress mechanism will be immediately documented and assessed, and appropriate mitigation measures will be integrated. Any risk that materially affect project's CABs, the environment, or stakeholder well-being will trigger additional mitigation measures and be reported to the project steering committee to ensure timely action.

4. Environmental and social impact

The environmental and social impacts of the activity were analyzed in consistency with the Adaptation Benefits Mechanism (ABM) Environmental and Social Guidelines also considered the standards of the Green Climate Fund (GCF) Environmental and Social Safeguards (document ABM MP/2022/15/14). The assessment process included:

- Screening of potential risks and impacts related to environmental and social aspects.
- Field visits and consultations held in 2021 with key stakeholders in Vavoua and Soubré, including farmer associations, local authorities (sub-prefectures and ANADER), the cocoa industries, REDD+ Secretariat, and Conseil Café-Cacao.
- Identification of mitigation and monitoring measures for all potential environmental and social risks, consolidated in an Environmental and Social Management Plan (ESMP).
- Disclosure and grievance handling mechanisms to ensure transparency and inclusion during project implementation.

This process confirmed that the activity generates overall positive environmental and social benefits and poses no major risks requiring a large-scale Environmental Impact Assessment (EIA). Details are provided in the document *Environmental and social safeguards*

5. Grievance redress mechanism

Given the limited literacy level of most farmers, the project will use WhatsApp voice messaging as an official grievance submission channel. Farmers may submit verbal complaints through voice notes, photos, or videos to a dedicated WhatsApp line managed by the Project Manager. Cooperative focal points will support farmers without smartphones. Upon receipt, all grievances will be acknowledged within 5 days, investigated and resolved within 30 days whenever possible. The Project Manager will communicate the resolution verbally to the complainant, and unresolved grievances will be escalated to the ABM EC for further review and redress.

6. Cost and financing structure of the project

6.1. Project cost breakdown

The cost of implementing sustainable cocoa agroforestry on one hectare land for delivering its expected short-term and long-term adaptation benefits is divided into three components over time:

- The first component covers the initial three years of cocoa farm establishment. It includes expenses related to farmers' capacity building, acquisition of planting materials, field preparation, micro-irrigation system preparation and setting, plantation operations, weeding, harvesting of associated annual crops, and monitoring of AB "Plantations under sustainable and climate-resilient practices" or SCR.
- The second component covers the period from years 4 to 10 after planting. During this time, required expenditures encompass weeding, pest and disease management, soil management, pruning, harvesting of both associated crops and cocoa, and efforts related to monitoring the outcomes proceeding from the SCR.

- The third component covers the overall project management expenses project registration and CAB fees, transaction costs, and institutional costs. These costs will be accurately fixed after the certification audit of the Ex-post modality.

These components were estimated based on ICRAF field experiences in Soubre and Vavoua (Côte d’Ivoire).

- **Component 1: Cocoa farm aged 0-3 years old.**

The cost of establishing a one-hectare sustainable and climate-resilient cocoa plantation, aged 0-3 years, totals five thousand nine hundred fifty-six dollars and seventy-seven cents (USD 5,956.77). The project is expected to contribute USD 3,109.5, with farmers contributing USD 2,847.27 in kind once this amount is provided. The details are broken down in the table 20 below.

Table 20: Cost of 1-hectare sustainably managed cocoa farm aged 0-3 years old.

Designation	Unit	Quantity	Unit cost (USD)	Cost (USD)	Contribution from the project (USD)	Contribution from the farmer (USD)
Training 1 farmer for 1 ha	Training day	4	108	432	432	0
Sensitization using leaflets about CSSV detection	Sensitizing session	5	0.2	1	1	0
Sensitization Against illegal logging campaign with local authorities	Radio program	10	0.1	1	1	0
Companion planting materials acquisition	Sapling / seeds	44	1.5	66	66	0
Cocoa planting materials acquisition	Sapling / seeds	1,419	1	1,419	0	1,419
Field preparation	Hectare	1	150	150	0	150
Micro-irrigation system	Tubes	1,463	1.5	2,194.5	2,194.5	0

Designation	Unit	Quantity	Unit cost (USD)	Cost (USD)	Contribution from the project (USD)	Contribution from the farmer (USD)
preparation and setting						
Water storage containers	#	1	350	350	350	0
Plantation operations	Planting instance	1,463	0.09	131.67	0	131.67
On-farm management operations	Hectare / Year	3	382.2	1,146.6	0	1,146.6
Monitoring “Sustainably Managed Cocoa plantation”	Expertise	3	15	45	45	0
Transaction Cost	Lump sum	1	20	20	20	0
Total amounts (USD)				5,956.77	3,109.5	2,847.27

- Component 2: Cocoa farm aged 4-10 years old.

In the period from 4 to 10 years after the establishment of the sustainably managed cocoa farms, the minimum cost for farm maintenance and monitoring is estimated at one thousand three dollars and thirty-five cents (USD 1,903.35) (Table 21). The maintenance cost alone is estimated at one thousand seven hundred ninety-eight and thirty-five cents (USD 1,798.35), provided by farmers as an in-kind contribution. The monitoring cost is estimated at fifteen dollars (USD 15) per year, funded by the project.

Table 21: Cost of sustainably managed cocoa farm aged 4-10 years old.

Designation	Unit	Quantity	Unit cost (USD)	Cost (USD)	Contribution from the project (USD)	Contribution from the farmer (USD)
On-farm management operations (Discounted)	Hectare / Year	7	256.91	1,798.35	0	1,798.35

Designation	Unit	Quantity	Unit cost (USD)	Cost (USD)	Contribution from the project (USD)	Contribution from the farmer (USD)
MRV Field Operations: Staff Time, Transport and Communication	Expertise	7	15	105	105	0
Total amounts (USD)				1,903.35	105	1,798.35

Component 3: Other costs

The third component covers project registration and CAB fees, transaction costs, and overall project management expenses. During the pilot phase, these costs were borne by the Africa Climate Change Fund (ACCF).

It is thus important to note that the current estimate of CAB costs is largely based on field data and remains indicative at this stage. Final costs will be determined following the application of the project's ex-post modality. The audit during the verification process will ensure full transparency and enable the confirmation of the definitive CAB cost.

6.2. Financing structure and blended funding approach

The project applies the ex-post modality under the Adaptation Benefit Mechanism (ABM), meaning that the project will first seek a grant funding from, in this case, the Adaptation Fund. These funds will be used to implement the first cohort of project activities. At year 3, verification and request for issuance of CABs will be undertaken and the resulting CABs will be sold in order to replenish the grant and finance the next cohort of planting activities.

From year 3 onwards, following the verification of cocoa establishment performance, CABs are expected to be issued based on achieved adaptation benefits. Revenues generated from the sale of these CABs will be reinvested into subsequent replantation cycles, thereby establishing a revolving financing mechanism that enables progressive scaling without continued reliance on grant funding.

To manage uncertainties related to the timing and volume of CAB revenues, the project adopts a conservative and phased implementation approach. Expansion beyond the initial cohort will be aligned with verified performance and available revenues, while prioritizing cost-efficient interventions. This ensures that the project remains financially viable even in the event of delayed or lower-than-expected CAB inflows.

It is worth noting that other sources of finance may also be mobilized and used to accelerate project implementation.

7. Cash Flow and sensitivity analysis

SCR profitability analysis shows good financial performance over a 10-year horizon (Excel Spreadsheet), with steady growth in projected cash flows from the sixth year onwards and a NPV of USD 11,210.87. With the effective entry into production of other agroforestry fruit crops, these cash flows will stabilize (around 15 years). This growth will cover the initial investment costs from the ninth year onwards (payback period of 9 years and 2 months), thus ensuring medium-term economic viability.

In table below, IRR for the base scenario (22.24%) exceeds WACC which is calculated at 7% based on the specific characteristics of the project. This level of return is reinforced by an IRR that remains higher than the WACC, even in the most pessimistic scenarios (IRR = 30.48% for a 20% drop in cocoa yields and IRR = 32.25% for a 10% drop in cocoa yields). Furthermore, the results of scenarios clearly reflect the model's sensitivity to the adoption or non-adoption of farming practices, as well as to climatic conditions.

Table 22. Cocoa yield-based sensitivity scenarios

Scenario	Cocoa yield (kg/ha)	Estimated IRR (%)	NPV (USD/ha)	Comments
Base (reference)	304	22.24%	11,210.9	Central assumption
Optimistic (+10 %)	334	35.34%	68,384.8	Adoption of best practices and favorable climatic conditions
Pessimistic (-10 %)	273	32.25%	54,272.5	Unfavorable climatic conditions, diseases, or failure to adopt practices
Optimistic + (+20 %)	365	36.71%	75,441.0	Adoption of best practices and favorable climatic conditions
Pessimistic + (-20 %)	243,0353943	30.48%	47,216.4	Unfavorable climatic conditions, diseases, or failure to adopt practices

8. MRV procedure and implementation

8.1. Farm identification and registry

Participating farms are registered during enrolment using the Regreening Africa App. Each farm record is associated with a project-specific farm identifier used for monitoring and reporting purposes. The farm record is linked to key attributes, including farmer identity, GPS location of the monitored plot, agroclimatic zone (Vavoua or Soubré), and planting date. Farm records are stored in a centralized project database and are used consistently across monitoring cycles for the duration of the project.

8.2. Field data collection procedures

Monitoring data are collected using the Regreening Africa App by trained community monitors under the supervision of the Project Implementation Unit. For each monitored farm, the following information is collected, as applicable:

- Farm ID (preloaded, non-editable);
- GPS coordinates;
- Required field data at farm level (survival rate, tree species, ect).



- Photographic evidence;
- Timestamp automatically recorded at submission;

All submissions are uploaded to the project's secure cloud server immediately or upon network availability.

8.3. Data integrity, storage, and version control

Submitted monitoring data are stored in the project's centralized database and managed to support consistency and traceability over time. Data quality control procedures include:

- Data entry: community monitors;
- Review and validation: project MRV officer;
- Read-only access: independent verifiers.

8.4. Data quality assurance and control procedures (QA/QC)

To ensure the accuracy, consistency, and reliability of monitoring data, QA/QC procedures are applied throughout data collection, validation, and reporting.

- Standardized data collection: Data are collected using the Regreening Africa App with predefined fields, non-editable farm IDs, and mandatory GPS coordinates and photographic evidence to reduce entry errors.
- Enumerator training and supervision: Community monitors are trained prior to data collection.
- Sampling and field verification: a statistically representative sample of farms is monitored. Supervisors conduct random spot checks on approximately 5–10% of monitored farms, including re-measurement of key variables (e.g., survival rates, farm boundaries).
- Data validation and cross-checks: submitted data are reviewed by the MRV Officer for completeness, consistency, and outliers. Cross-checks are performed between field records, GPS data, and photographic evidence.
- Error detection and correction: identified inconsistencies are flagged and corrected through follow-up verification with field teams. Where necessary, farms may be revisited or data re-collected.
- Data traceability: All records are time-stamped and linked to unique farm identifiers, ensuring full traceability across monitoring cycles and supporting independent verification.

8.5. Verification roles and responsibilities

Trained community members collect field data in accordance with approved monitoring protocols. The Project MRV Officer conducts internal quality checks and prepares monitoring datasets for verification. Independent verifiers review sampled monitoring records, assess compliance with approved monitoring procedures, and validate Adaptation Benefits (ABs) prior to the issuance of Climate Adaptation Benefits (CABs).

8.6. Verification checkpoints and CAB issuance linkage

Verification checkpoints are explicitly tied to CAB issuance events:

- Year 3 checkpoint: verification of farm establishment and survival of shade trees.
- Years 7–10 checkpoints: verification of continued maintenance of shade trees and agroforestry practices.

CABs are issued only for farms that pass the relevant verification checkpoint. Records failing verification are flagged, and corresponding CABs are not issued.

8.7. Continuity and traceability over time

Continuity and traceability are supported through the consistent use of farm identifiers, geo-referenced monitoring records, time-stamped data collection, photographic evidence, and documented verification checkpoints. This approach enables linkage between field observations, monitoring datasets, and CAB issuance decisions across multiple monitoring cycles and supports independent verification and audit throughout the project lifetime.

8.8. Sample data availability

Upon request, an anonymized sample of monitoring data, including farm identifiers, GPS locations, dates of data collection, and photographic evidence, will be made available to independent verifiers to demonstrate monitoring procedures and data management processes.

8.9. Recalculation

Recalculation of CABs is required if monitored/verified data indicate a material change in the effective farm area under approved sustainable agroforestry measures. Specific triggers include corrections to farm boundaries, updates from GPS or satellite surveys, land-use changes, or deviations in agricultural practices that reduce the area under the prescribed climate resilient practices. Minor variations within the measurement uncertainty ($\pm 5\%$) do not require recalculation. Recalculation is initiated by the MRV Officer, verified using field data from the Regreening Africa App and supporting evidence such as photographic or remote-sensing data, and approved by the Project Manager or designated senior staff. All recalculated CABs are documented in the project registry.

9. Adjustment of CABs

Certified Adaptation Benefits are adjusted based on verified monitoring results confirming deviation or attrition. Farms with detected deviations or attrition are flagged in the project registry and supported by verification evidence. Unresolved deviations lead to proportional reduction or deferral of CAB issuance for the affected monitoring period. Confirmed attrition leads to non-issuance of future CABs and, where applicable, clawback of previously issued CABs. All adjustments are approved by ABM-EC in the CAB issuance and registry records.

10. Implementation timeline

Project implementation is governed by the rainy season. Planting activities must be carried out during the site-specific peak of the rainy season to ensure optimal establishment before dry season. Consequently, all preparatory activities—including site selection, procurement, and capacity building—will be implemented during the four-months preceding the peak rainy month. In the Soubre region, this peak rainy month is June while for Vavoua it is September.

References

- [1] FAO. FAOSTAT statistical database 2025.
- [2] World Bank Group. Situation Economique en Cote d'Ivoire: Au pays du cacao - comment transformer la Cote d'Ivoire. 9th ed. World Bank; 2019.
- [3] Trisos CH, Adelekan IO, Totin E, Ayanlade A, Efitre J, Gameda A, Kalaba K, Lennard C, Masao C, Mgaya Y, Ngaruiya G, Olago D, Simpson NP, Zakieldeen S. Chapter 9: Africa. Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, UK and New York, USA: Cambridge University Press; 2022, p. 1285–455.
- [4] Mensah EO, Vaast P, Asare R, Amoatey CA, Owusu K, Asitoakor BK, Ræbild A. Cocoa Under Heat and Drought Stress. In: Olwig MF, Skovmand Bosselmann A, Owusu K, editors. Agroforestry as Climate Change Adaptation: The Case of Cocoa Farming in Ghana, Cham: Springer International Publishing; 2024, p. 35–57. https://doi.org/10.1007/978-3-031-45635-0_2.
- [5] Ariza-Salamanca AJ, Navarro-Cerrillo RM, Quero-Pérez JL, Gallardo-Armas B, Crozier J, Stirling C, de Sousa K, González-Moreno P. Vulnerability of cocoa-based agroforestry systems to climate change in West Africa. *Sci Rep* 2023;13:10033. <https://doi.org/10.1038/s41598-023-37180-3>.
- [6] Schroth G, Läderach P, Martinez-Valle AI, Bunn C, Jassogne L. Vulnerability to climate change of cocoa in West Africa: Patterns, opportunities and limits to adaptation. *Science of The Total Environment* 2016;556:231–41. <https://doi.org/10.1016/j.scitotenv.2016.03.024>.
- [7] Girvetz EH, Ramírez Villegas JA, Claessens L, Lamanna C, Navarro Racines CE, Nowak AC, Thornton PK, Rosenstock TS. Future climate projections in Africa: where are we headed? *The Climate-Smart Agriculture Papers* 2019:15–27. https://doi.org/10.1007/978-3-319-92798-5_2.
- [8] République de Côte d'Ivoire. Contributions Déterminées au niveau National CDN-Côte d'Ivoire 2022.
- [9] Niether W, Jacobi J, Blaser WJ, Andres C, Armengot L. Cocoa agroforestry systems versus monocultures: a multi-dimensional meta-analysis. *Environmental Research Letters* 2020;15:104085. <https://doi.org/10.1088/1748-9326/abb053>.
- [10] Kassin KE, Doffangui K, Kouamé B, Yoro RG, Assa A. Variabilité pluviométrique et perspectives pour la replantation cacaoyère dans le Centre Ouest de la Côte d'Ivoire. *Journal of Applied Biosciences* 2008;12:633–41.
- [11] Wessel M, Quist-Wessel PMF. Cocoa production in West Africa, a review and analysis of recent developments. *NJAS: Wageningen Journal of Life Sciences* 2015;74–75:1–7. <https://doi.org/10.1016/j.njas.2015.09.001>.
- [12] Ruf F, Bini S. Cocoa and fertilizers in West-Africa, Amsterdam (Netherlands): 2011, p. 1–8.
- [13] Duguma B, Gockowski J, Bakala J. Smallholder Cocoa (*Theobroma cacao* Linn.) cultivation in agroforestry systems of West and Central Africa: challenges and opportunities. *Agroforestry Systems* 2001;51:177–88. <https://doi.org/10.1023/A:1010747224249>.

- [14] Cabral JP, Faria D, Morante-Filho JC. Landscape composition is more important than local vegetation structure for understory birds in cocoa agroforestry systems. *Forest Ecology and Management* 2021;481:118704. <https://doi.org/10.1016/j.foreco.2020.118704>.
- [15] Ruf FO. The Myth of Complex Cocoa Agroforests: The Case of Ghana. *Human Ecology* 2011;39:373–88. <https://doi.org/10.1007/s10745-011-9392-0>.
- [16] Uribe-Leitz E, Ruf F. Cocoa certification in West Africa: The need for change. *Sustainable global value chains*, Springer; 2019, p. 435–61.
- [17] Kouassi J-L, Diby L, Konan D, Kouassi A, Bene Y, Kouamé C. Drivers of cocoa agroforestry adoption by smallholder farmers around the Taï National Park in southwestern Côte d’Ivoire. *Scientific Reports* 2023;13:1–13. <https://doi.org/10.1038/s41598-023-41593-5>.
- [18] INS. Recensement général de la population et de l’habitat 2021. Abidjan, Côte d’Ivoire: Institut national de la statistique; 2022.
- [19] Bunn C, Läderach P, Quaye A, Muilerman S, Noponen MRA, Lundy M. Recommendation domains to scale out climate change adaptation in cocoa production in Ghana. *Climate Services* 2019;16:1–12. <https://doi.org/10.1016/j.cliser.2019.100123>.
- [20] Becker A, Wegner JD, Dawoe E, Schindler K, Thompson WJ, Bunn C, Garrett RD, Castro-Llanos F, Hart SP, Blaser-Hart WJ. The unrealized potential of agroforestry for an emissions-intensive agricultural commodity. *Nature Sustainability* 2025. <https://doi.org/10.1038/s41893-025-01608-7>.
- [21] Abdulai I, Vaast P, Hoffmann MP, Asare R, Jassogne L, Van Asten P, Rötter RP, Graefe S. Cocoa agroforestry is less resilient to sub-optimal and extreme climate than cocoa in full sun. *Glob Chang Biol* 2018;24:273–86. <https://doi.org/10.1111/gcb.13885>.
- [22] Gockowski J, Sonwa D. Cocoa intensification scenarios and their predicted impact on CO₂ emissions, biodiversity conservation, and rural livelihoods in the Guinea rain forest of West Africa. *Environ Manage* 2011;48:307–21. <https://doi.org/10.1007/s00267-010-9602-3>.
- [23] Kroeger A, Bakhtary H, Haupt F, Streck C. Eliminating deforestation from the cocoa supply chain. World Bank; 2017.
- [24] Läderach P, Martinez-Valle A, Schroth G, Castro N. Predicting the future climatic suitability for cocoa farming of the world’s leading producer countries, Ghana and Côte d’Ivoire. *Climatic Change* 2013;119:841–54. <https://doi.org/10.1007/s10584-013-0774-8>.
- [25] Allen IV J, Gilligan DO, Kurdi S, Yassa B. Would you rather? Household choice between cash transfers or an economic inclusion program. Egypt: International Food Policy Research Institute; 2024.
- [26] Barrientos S. Gendered Global Production Networks: Analysis of Cocoa–Chocolate Sourcing. *Regional Studies* 2014;48:791–803. <https://doi.org/10.1080/00343404.2013.878799>.
- [27] Bymolt R, Laven A, Tyszler M. Demystifying the Cocoa Sector in Ghana and Côte d’Ivoire. Royal Tropical Institute (KIT). Amsterdam, Pays-Bas: 2018.
- [28] Somarriba E, Peguero F, Cerda R, Orozco-Aguilar L, López-Sampson A, Leandro-Muñoz ME, Jagoret P, Sinclair FL. Rehabilitation and renovation of cocoa (*Theobroma cacao* L.)



agroforestry systems. A review. *Agronomy for Sustainable Development* 2021;41:1–19.
<https://doi.org/10.1007/s13593-021-00717-9>.



ANNEX 1: TREE-TENURE REGISTRY TEMPLATE (Article 27 – Forestry Code No. 2019-675 of the Republic of Côte d’Ivoire)

Adaptation Benefits Mechanism (ABM) Project: _____

ABM Approval No.: _____

This Tree-Tenure Registry was established on the basis of information collected and verified under the Monitoring, Reporting, and Verification (MRV) system of the **Adaptation Benefits Mechanism (ABM) Project [Project Title], Approval No. [ABM Approval Number]**.

The undersigned certifies that this registry lists farmers whose participation confirms that they planted the trees identified on the registered parcels. In accordance with **Article 27 of Forestry Code No. 2019-675**, ownership of the planted trees belongs to the person who planted them.

This registry is hereby **certified as a true and complete record** of the farmers listed herein and their declared tree ownership, for all legal purposes, including proof of ownership and protection against unauthorized cutting or exploitation by third parties.

Done at _____, on _____.

For the Project Implementing Entity

Name: _____

Title: _____

Signature: _____

Date: _____

Certified by the Local Authority

Name: _____

Office: _____

Signature and Official Seal: _____

Date: _____

No.	Farmer Name	Farmer ID Number	Village / Community	GPS Coordinates (Polygon)	Planting Date	Tree Species / Type (shade/intercrop)
1						
2						
...						