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EVALUATION DESIGN REPORT

Evaluation Design Report for the USAID/West Africa RESTORE Activity

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Contents

Table of Figures

Table of Tables

Acronyms

AFOR	l'Agence Foncière Rurale
CDI	Côte d'Ivoire
CSA	Climate Smart Agriculture
DID	Difference-in-Differences
DQA	Data Quality Assurance
ET	Evaluation Team
FA	Feasibility Assessment
FGD	Focus Group Discussion
GIS	Geographic Information System
HEARTH	Health, Ecosystems, and Agriculture for Resilient Thriving Societies
HFC	High Frequency Check
ICC	Intra-Cluster Correlation
IE	Impact Evaluation
IP	Implementing Partner
INRM	Integrated Natural Resource Management
IRB	Institutional Review Board
KII	Key Informant Interview
LMB	Landscape Management Board
LQ	Learning Question
ofi	Olam Food Ingredients
PE	Performance Evaluation
PII	Personally Identifiable Information
RA	Rainforest Alliance
REDD+	Reducing Emissions from Deforestation and Degradation
RESTORE	Resilient Ecosystem and Sustainable Transformation of Rural Economies
RMSC	Resource Management Support Centre
SA	Strategic Approach
SI	Social Impact
TOC	Theory of Change
USAID	United States Agency for International Development

Introduction and Background

The following section introduces the RESTORE Activity as well as the evaluation, including the primary objectives and purpose, an overview of the feasibility assessment (FA), and activities completed to date, as well as some local context for the United States Agency for International Development's (USAID's) West Africa Resilient Ecosystem and Sustainable Transformation of Rural Economies (RESTORE) Activity in Ghana and Côte d'Ivoire (CDI).

Introduction

The objective of this report is to provide details on the impact and performance evaluation (PE) design for the Health, Ecosystems, and Agriculture for Resilient Thriving Societies (HEARTH) RESTORE activity in in Ghana and CDI (five-year program, beginning in late 2022). This evaluation design report, developed under the Integrated Natural Resource Management (INRM) Task Order, includes an overview of the RESTORE activity strategic approaches (SAs), and relevant theory of change (TOC), evaluation questions, indicators, evaluation approaches/methods, and statistical power calculations for each. It also provides details on the plans for baseline data collection and management, as well as overall analysis plans and a discussion of potential limitations, risks, and challenges.

Objective and Background

Given the lack of rigorous evidence on the effectiveness of the RESTORE Activity's interventions, this evaluation presents an important opportunity to improve USAID's understanding of conservation and biodiversity programming impacts, advancing USAID's and the HEARTH portfolio's Learning Agenda. In particular, the RESTORE Activity presents a unique opportunity to measure the effect of integrated programming on conservation and biodiversity outcomes. This will be achieved through the coupled social and ecological data collection and analysis supported through this evaluation.

An Evaluation FA was conducted in late 2022 to mid-2023 by INRM for the RESTORE Activity to assess evaluation options. The FA considered potential design options, including impact evaluation (IE) and PE, that meet Agency-wide HEARTH and Mission learning interests, with the goal of determining the most rigorous options that can be applied given Activity implementation, evaluation resources, and other constraints for this activity. The FA found that the RESTORE Activity presents an important opportunity to improve USAID's understanding of conservation and biodiversity programming through a mixed methods evaluation, including both IE and PE components. USAID approved moving forward with the evaluation in June 2023.

The FA was implemented through an incremental approach, given the phased approach to RESTORE's implementation plan. During the first phase (August 2022 - January 2023), the evaluation team (ET) assessed the viability of a rigorous evaluation for on-farm cocoa agroforestry, land and/or tree tenure, and alternative livelihoods activities. During the first phase, the implementing partners (IPs) were still

working on finalizing the workplan and site selection for a fourth component, off-farm forest restoration. In the second phase, the INRM conducted one scoping trip in May 2023, which coincided with the expected timeline for off-farm workplan clarification and site selection, as well as a scoping trip in September 2023 that focused on gaining detailed understanding of the ecological context. The final evaluation design options presented in this report are based on information obtained during these scoping trips, as well as continued discussions with the IPs and other in-country stakeholders, a review of project documents and data received to date, and secondary literature and data.

Scope of the Evaluation Report

This evaluation design report includes the approaches, methods, and data sources for the human well-being (social) outcomes, as well as the forest condition, biodiversity, zoonosis risk outcomes that will be captured by field-based ecological data collection efforts and satellite-imagery. The ET aims to prepare for data collection from November to early January and conduct fieldwork simultaneously around late-January to March in both countries. The data collection is time sensitive as most of the sites will not be accessible during the rainy season, which usually begins around April or May. The ET therefore must begin baseline data collection before the rainy season, as key implementation activities, including off-farm tree planting, will be done during the rainy season.

Local Context

CDI and Ghana are by far the two largest cocoa producers in the world, and cocoa production is the fourth largest commodity production— behind beef, palm oil, and soy— that drives global deforestation, associated greenhouse gas emissions, and biodiversity loss (Antonarakis, 2022). Cocoa production flourishes in the Guinean forest biome in Ghana and CDI, a biodiverse lowland and tropical forest region with more than 60 endemic mammalian species.

Several factors drive deforestation in cocoa producing landscapes, including agricultural expansion, weak and mismatched land and resource governance, excessive local harvesting of wood for fuel, and insufficient sustainability practices (e.g., climate-resilient agroforestry). Agricultural expansion is driven by the increasing global demand for cocoa and declining yields (and farmer income) associated with climate change. A 2017 research study by Mighty Earth found that between 2002 and 2014, 117,866 ha of protected forest areas were cleared in Cote d'Ivoire and 700,000 ha in Ghana. The study attributed approximately one quarter of the deforestation to the cocoa and chocolate industry. Climate change has increased extreme weather variability, which has led to drought, disease, and reduced pollination. These factors have combined to further reduce cocoa yields, and as cocoa yields and income continue to decline, land conversion is exacerbated in a vicious feedback cycle.

A high percentage of cocoa farmers live below the poverty line and experience food insecurity. Cocoa farmers capture only a small percentage of the cocoa and chocolate supply chain, even though cocoa export account for 50 percent and 22 percent of the CDI and Ghana's total country earnings respectively.[1] As there are few non-cocoa income opportunities and the costs of switching to non-cocoa

[1] A 2018 Bloomberg Study found cocoa farms capture 5.5 percent of the supply chain.

production are high, farmers compensate for declining yields by producing more cocoa on more land. In CDI, this is compounded by weak enforcement of protected areas that facilitates forest conversion (Shyamsundar, 2021). In Ghana, one response has been a surge in illegal and environmentally destructive activities, especially artisanal gold mining. Illegal logging continues unabated, and the energy needs of households continues to be met mostly by fuelwood and charcoal.

The limited earnings from cocoa production also reach men and women disproportionally. According to the International Cocoa Initiative, women own between a fifth and a quarter of the cocoa farms and comprise most farm labor in both countries. A 2008 study by Harvard University found that women cocoa farmers in Ghana earn 25 to 30 percent less than their male counterparts, and in CDI up to 70 percent less. In both countries, women have less access than men to land, credit, farm inputs, technical support, social security, and other services.

Regional and local legislation are underway to increase cocoa landscape conservation and address poverty and social issues experienced by cocoa farmers. The joint industry-government Framework for Action of the 2017 Cocoa and Forests Initiative has been driving investments in sustainable cocoa production and supply chain transparency in Ghana and CDI. The 2019 joint announcement of the Living Income Differential by the two governments seeks to ensure higher prices reach farmers. The 2019 forest code in CDI gives primacy on tree tenure to the landowner; however, the mechanisms to implement the policies are not fully operational. In addition, Ghana's current tree tenure policy disincentivizes cocoa farmers to plant and nurture trees on farm. As explained in a recent USAID report, "A leading challenge to planting more shade trees is government ownership and control of all naturally occurring timber trees – even on privately held land. State ownership of naturally occurring trees is widely considered a strong disincentive for landowners and smallholders, regardless of land tenure, to nurture trees on their cocoa farms." (Antwi et al. 2021). As such, the evaluation of the RESTORE activity and other similar programs would bring great value to the implementation context as policies and procedures are currently being put in place.

RESTORE Activity Overview

The RESTORE activity is implemented by a private-public alliance of the Rainforest Alliance (RA) and Olam Food Ingredients (ofi), in partnership with multinational chocolate companies, farmer cooperatives, and local partners. Over five years the Activity will establish the technical capacity, policy implementation approaches, and economic incentives to bring cocoa producing families, governments, and private sector actors together to secure improved livelihoods from cocoa farming, promote socially inclusive economic opportunities, increase tree cover, reduce threats to biodiversity, and contribute to national and corporate emission reduction targets.

The Alliance and its partners selected three priority areas in critically threatened, highly biodiverse and culturally diverse, impoverished landscapes in the Guinean forest landscape of Ghana and CDI (see Figure 1 below) with the intention of conserving biodiversity in protected areas and their buffer zones. Priority areas include:

- Sui river landscape (Western Zone B HIA) in Ghana. The landscape spans four political districts (Bodi, Sefwi-Wiawso, Sefwi Akontombra, Bibiani-Anhwiaso-Bekwai).
- South Taï National Park Landscape (Tabou and Méaguy departments) in western CDI.
- Beki-Bossematie landscape (Adzopé, Abengourou, Bettié and Arrah departments) in eastern CDI.

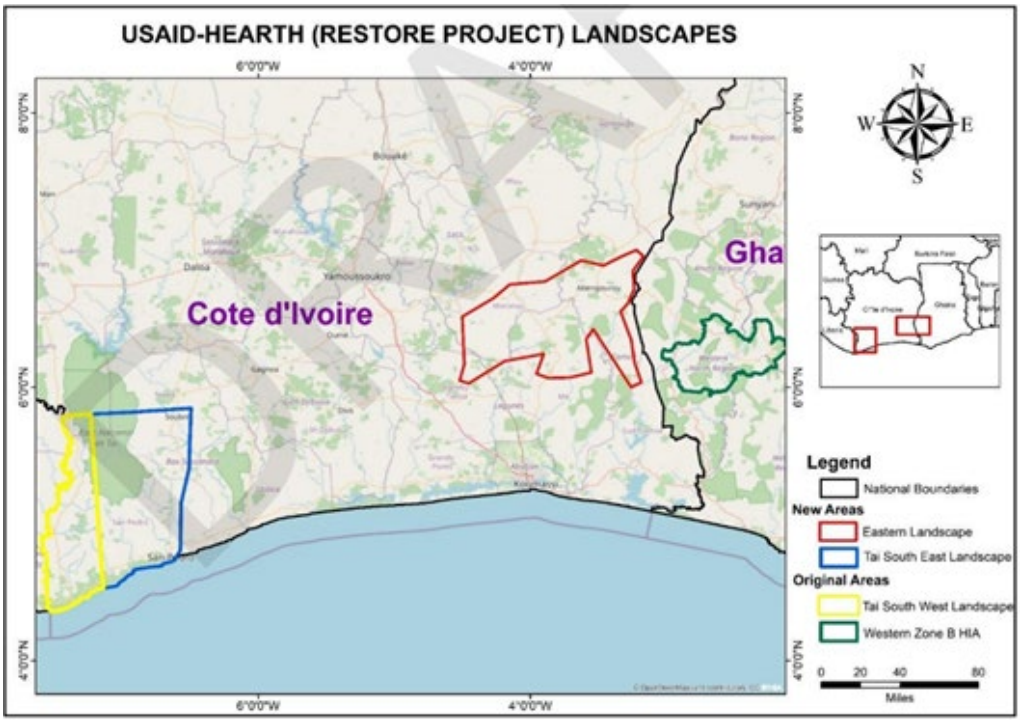

Figure 1. Map of RESTORE landscapes

Sui River Landscape in Ghana. The Sui River Landscape covers four political districts: Bibiani-Anhwiaso-Bekwai, Sefwi Wiawso, Akontombra and Bodi in the Western North region of Ghana. This is the most advanced landscape in terms of building a demonstration site for a scalable and replicable model for community-led governance, natural resource management and biodiversity conservation that aligns with government priorities in cocoa and forest production landscapes. Cocoa farming is the most important land use and livelihood opportunity accounting for around 70 percent of the landscape for a population predominantly made up of indigenous and migrant settlers.

South Taï National Park Landscape in Western Cote d'Ivoire. The southwestern landscape project is south of the Taï National Park and heavily fragmented with remaining forest patches demonstrating a significantly reduced biological value. In the southwest region, research results showed an increase of cultivated areas at the expense of forest areas between 1988 and 2019. From 2001-2019 some reforestation is observed in the south including integration of trees in cocoa system through similar effort of RA-ofi. The critical objective in this landscape is to halt further deforestation, degradation, and fragmentation of the existing landscape to avoid a total collapse of ecosystem functioning while supporting the people in the cocoa communities to strengthen their resilience progress towards a living income and thrive.

Beki-Bossematie Landscape in Eastern Cote d'Ivoire. The Beki-Bossematie landscape borders La Mé, Iffou, Indénié-Djuablin and Morounou, and covers several classified forests of varying degree of degradation. The forest of Bossematie is a key Biodiversity Area. Together with Agnéby Tiassa the region contributes up to 10.4 percent of the total cocoa production for the country. Other important crops include rubber, palm oil, coffee, and timber. The region has a high degree of poverty – between 46.4 and 72.9 percent of the region live below the poverty line.

RESTORE's SAs in these areas are as follows:

- **SA1:** Improve tree and/or land tenure processes and strengthen incentives for tree growing and conservation to restore tree cover and protect forest both on- and off-farms.
- **SA2:** Establish and strengthen the business and governance capacity of Landscape Management Boards (LMBs) and improve the conservation and natural resource management support that they provide to farmers.
- **SA3:** Increase use of climate-smart, more productive, regenerative and sustainable cocoa production by improving farmers' capacities, knowledge, and resources.
- **SA4:** Promote and strengthen forest-friendly livelihood diversification through women- and youth-inclusive approaches that improve skills and access to funding, inputs, and markets.

Through these SAs, RESTORE's ultimate objective is to improve livelihoods and well-being, increase tree cover, and make a sustainable contribution to national and corporate emission reduction targets.[2] To avoid forest conversion and increase tree coverage, RESTORE's interventions must address farmers' low incomes and yields. In the three landscapes, the RESTORE Activity is expected to have a direct impact on an estimated 15,000 farmers managing 50,000 ha of farmland and working in the supply chain of ofi, in partnership with chocolate brands in the project landscapes. By increasing farmland productivity, the Activity aims to avoid deforestation through farmland expansion, and increase on-farm tree coverage in the targeted landscapes. In addition, outside of farms, the Activity is anticipated to improve the management of a buffer area around existing reserves and parks (primarily through supporting local governance boards), and identify areas for active reforestation.[3] Activity wide Outcomes as found in the RESTORE Cooperative Agreement and Activity Monitoring, Evaluation and Learning Plan can be seen in Table 1. Outcome indicators are regional and outcome achievement may vary between Ghana and Cote D'Ivoire.

[2] Enokou, C. (2023). Resilient Ecosystems and Sustainable Transformation of Rural Economies: Activity Work Plan FY2024. USAID.

[3] Off-farm reforestation efforts have been concentrated on off-farm tree planting and do not, at this time, take into consideration the removal of invasive species or the reconstruction of other environmental conditions (like water table levels). In addition, the scale and density of these efforts may inhibit biodiversity outcomes as explained further in this report.

Table 1: RESTORE Activity Expected End of Project Outcomes[4,5]

Activity-Wide Outcomes	Outcome Indicators	SA(s)
Pressure Reduced – Targeted cocoa farmers do not expand into forest reserves or other protected areas.	25 percent reduction in encroachment	**SA1, SA2, SA3, SA4**
Ecologically Important Land[6] Restored on non-agricultural degraded lands	5,000 ha of ecologically important land outside of farms and protected areas in the project landscapes are being restored[7]	**SA1, SA2**
Forests Conserved – Areas around reserves and parks, and unclassified forests on target landscapes, are better managed and protected with community collaboration.	50 percent of community members in the project landscapes are actively participating in LMB action plans to conserve the forests with 50 percent being women and youth	**SA2**
Tree cover increased on farms in targeted landscapes	Farmland in project landscapes has 15 percent denser tree cover	**SA1, SA3**
Lives Improved – Participating members of cocoa farming households are income and food secure	70 percent of farming households confirm they have improved their livelihoods	**SA3, SA4**

INTERVENTION DETAILS

The below sections detail intervention plans for each SA, including Year 1 (2023) activities that have already taken place, as well as planned activities for Year 2 (2024) and beyond, to the extent that they are known at this time. Implementation details for each country are slightly different, as country workplans are context specific and were developed in consultations with the country government and stakeholders on each landscape.

STRATEGIC APPROACH 1

Improve tree and/or land tenure processes and strengthen incentives for tree growing and conservation to restore tree cover and protect forest.

SA1 includes four main components: (1) support for on-farm tree planting, (2) support for tenure (land tenure in CDI and land tree registration in Ghana), (3) support for off-farm village boundary planting in CDI, and (4) off-farm tree planting through Landscape Action Plans in select RESTORE villages in

[4] RESTORE Cooperative Agreement. Attachment B – Activity Description.

[5] Enokou, C. (2022). Resilient Ecosystems and Sustainable Transformation of Rural Economies: Activity Monitoring, Evaluation, Research and Learning Plan. USAID.

[6] The Cooperative Agreement refers to "Forests" restored. We have revised this to Ecologically Important Land to better reflect the work done under the Activity.

[7] The Activity Monitoring, Evaluation, and Learning Plan doesn't clearly define restoration for these 5,000 ha beyond noting "tree cover is increased by at least 5,000 ha under protection and sustainable management." (pg 3).

Ghana.[8] SA1 activities begun in Q1 2023 with awareness building, stakeholder mobilization, and boundary mapping.

On-farm tree planting. On-farm tree planting educates, motivates, and enables farmers to introduce appropriate shade and other native trees to their farms. In both countries, the first on-farm planting support, administered through farmer cooperatives, occurred during the planting season of May to July 2023. The 2023 Annual Report notes the project distributed 192,737 shade trees to over 5,000 farmers, covering 5,456 hectares throughout the two countries. 4752 farm plots out of a total of 14495 farm plots fall within a 5 km buffer of official Protected Area or Forest Reserves[9]. The on-farm planting support included sensitization trainings (4,469 farmers trained) on agroforestry, forest protection, importance of trees, etc., establishing demonstration plots, and shade tree seedling distribution. In Western Africa, cocoa-agroforestry that utilizes shade-trees and optimal agroforestry management has the potential to produce win-win outcomes of improved social benefits at the local level (rural development and climate change adaptation with sustained cocoa farm yields) and global environmental benefits such as carbon sequestration (Tschora and Cherubini, 2020)

Support for tenure. For the tenure interventions in CDI, RA, worked with government agency Agence Foncière Rurale (AFOR) to delineate five villages where AFOR was not already present. These five villages are in addition to 44 RESTORE villages where AFOR started the village delineation process prior to RESTORE, including the establishment of Village Committees in each village. By the time of this report, all 49 villages have received official demarcation through a demarcation and dispute resolution process with AFOR. RESTORE will support tree boundary planting to assist in defining village boundaries and increasing off-farm tree coverage (see more on boundary planting below).[10]

In Ghana, RA will facilitate digitized tree registration with the Resource Management Support Centre (RMSC) of the Forestry Commission (FC). The current approach to tree registration has been piloted on paper in Ghana since 2018 with plans to develop an electronic platform during the RESTORE implementation period (Dohmen, 2018). RA also plans to conduct training and capacity building for the FC staff and community enumerators. Thus far, a memorandum of understanding has been developed among RMSC, RA and ofi and 34 individuals from 17 communities were sensitized in the tree registration process. Tree registration determines who has the authority over what happens to the tree and who may receive financial compensation if the tree is cut. By increasing the potential benefits

[8] In Côte d'Ivoire, the IPs are exploring brokering villages' participation in REDD+ benefits. Activities commenced in Q4 2022 and Q1 2023 with community boundaries delineation, village mapping, and restoration site identification, and brokering a relationship with the REDD+ secretariat. In addition to planting through the village boundary delineation workplan, the IPs indicate in the 2024 draft annual workplan, that they are continuing to strengthen collaboration with a wider set of stakeholders on the landscapes, in order to identify new sites and mobilize investments and buy-ins for additional restoration plans. This includes the establishment of a community forest of 4.36 hectares, in the Beki- Bossématié landscape. (RESTORE Annual Progress Report, FY2023).

[9] This information was calculated based on farmer plot GIS data which the IPs shared with the ET team in August 2022. The information may be outdated, though these statistics still illustrates of the general spread of RESTORE cocoa farms relative to official protected areas and forest reserves.

[10] In CDI, the IPs also plan to conduct a smallholder carbon feasibility study in FY2024, including understanding how the national REDD+ strategy and mechanism, to be made public in 2024, can be harnessed to provide carbon credits to small-holder farmers, including for community and individual farmer managed off-farm trees, as well as on-farm practices.

associated with timber and non-timber trees, individuals may be incentivized to plant new trees conducive to cocoa cultivation and support re-forestation (Dohmen, 2018).

Off-farm Boundary Planting. In CDI, off-farm planting is primarily limited at this time[11] to village boundary planting in 49 RESTORE villages where AFOR has completed the delineation process. Table 2 shows the spread of the villages across the landscape. Now that village demarcation is complete, ofi nurseries will plant one row of trees per village, primarily utilizing native species. With a tree every 20 meters, 593 kilometers of trees are anticipated (238 hectares). However, tree density is expected to be low, reducing potential biodiversity outcomes one may expect from more heavily forested areas. For villages that share a border with another boundary planting village, one row will be planted for each village. Though native trees could bring localized ecological benefits (especially in rural areas where it is especially depleted), the ET team cautions that it falls short of the aim of forest restoration, which is to revive forest ecosystems to harness larger ecosystem benefits. In the fragmented forests of these cocoa-landscapes, it is intentional plot planting focused on forest corridor reconnection, that has the most potential to have substantive mitigation impact on biodiversity and conservation.

Table 2: Villages targeted for off-farm boundary planting in CDI

Landscape	Regions	Departments	Sub-prefectures	Number of boundary planting
Bossématié	La Me	Adzope	Bécédi Brignan	2
			Adzopé	2
			Annépé	2
			YAKASSE-ME	1
	Indénié Djuablin	Abengourou	Abengourou	2
			Zaranou	4
			Aniassue	7
			Amelikia	8
			Niable	1
		Bettie	Bettie	1
			Ebilassokro	1
			Diamarakro	1
	Mononou	Arrah	Kotobi	1
Subtotal				**33**
South Tai National Park	San Pedro	Tabou	Djouroutou	9
			Grabo	5
			Olodio	2
Subtotal				**16**

[11] RESTORE continues to make an effort in CDI to expand off-farm planting into forest restoration and conservation, see more under off-farm forest restoration below.

Off-farm Forest Restoration. In Ghana, off-farm planting will take place in select RESTORE villages who expressed interest in active forest restoration efforts. In total, RESTORE has currently identified approximately 40 hectares of community land (of 5 to 6 discrete sections) for restoration in Ghana. The restoration areas are identified by local villages. Active restoration plans include planting native trees, and putting in place community-led tree management strategies. RESTORE began restoration on 8.5 hectares in 2023, monitored by the local LMB. The remaining 34 hectares have been identified and will begin restoration (tree planting) in 2024.

In CDI, originally, no off-farm restoration outside of boundary planting activities were identified and the evaluation was designed to focus on on-farm and boundary planting efforts in CDI. However, the 2023 Annual Report notes that 4.36 hectares land in CDI have been designated as a community forest. Tree planting and monitoring will be conducted by community members in the Bossematie landscape, under supervision by the Ministry of Forest and Water and technical consultants. The forest is anticipated to be transferred to the management of the LMB once established. No additional hectares have been identified for off-farm restoration in CDI though IPs plan to continue their efforts to strengthen collaboration of landscape stakeholders (communities, customary authorities, government ministries, private actors) to identify new restoration sites and mobilize additional investments on both the Bossématié and San Pedro landscapes.

In 2024, the planned off-farm tree planting will take place between May and August 2024 (rainy season). In both countries, the IPs began building awareness, mobilizing key stakeholders, and identifying areas for conservation starting in October 2022. The IPs established tree nurseries after a consolatory process with local communities to select tree species. As of June 2023, 364,357 seedlings of forest trees were growing for distribution.[12]

Strategic Approach 2

Establish and strengthen the business and governance capacity of LMBs and improve the conservation and natural resource management support that they provide to farmers.

SA2 involves the establishment of LMBs and Land Management Plans, along with supporting LMBs to improve management structures, incorporate adaptive management and community participation, as well as strengthen the administrative and management capacity of older LMBs.

In CDI, RA intends to establish village-level committees in each village and landscape level LMBs. RA began building awareness in late 2022 and conducted a landscape scoping study in 2023. In 2023, two major consultative workshops resulted in 26 village committees established which will eventually feed into LMBs. The project aims to revive and expand one existing LMB in Tai landscape and create a new LMB in the eastern landscape through a multi-stakeholder platform. In addition, RESTORE is also supporting cooperatives in designing landscape management plans to understand natural resource use and agricultural practices in a 2-5 km buffer zone around Protected Areas to reduce ecological threats in this zone.

[12] RA. (2023) RESTORE Quarterly performance report: Q3 FY 2023 (April – June 2023)

In Ghana, LMBs already exists in the Sui River landscape and are more mature. For these, starting in early 2023, RA guided the LMBs on the development of indicators, a monitoring plan, and financial plans (including identifying long-term revenue models from sustainable alternative livelihood enterprises, membership dues, and Reducing Emissions from Deforestation and Degradation (REDD+) benefit sharing plan). LMB members were trained on five different forest-friendly enterprises and 122 start-up kits were provided (see more under SA4). The IPs also supported the use of hybrid community-based monitoring system and Landscale for landscape assessment and collecting and monitoring landscape variables for adaptive management. A new partnership is being explored with conservation-focused NGO Save Ghana Frogs, to collaborate with the LMB in their biodiversity protection efforts around the Sui River Forest Reserve.

STRATEGIC APPROACH 3

Use of climate-smart, more productive, regenerative, and sustainable cocoa production by improving farmers' capacities, knowledge, and resources.

SA3 activities include developing and providing trainings to farmers on regenerative agriculture and sustainable cocoa production. Through community service groups[13] and media, ofi will provide technical support and disseminate knowledge on regenerative agricultural technique, including the use of shade trees and other tree crops, as well as forest conservation, regenerative soil management practices, use of organic matter as compost, intercropping with leguminous plants and fruit/nut trees, and establishing emergency plans to deal with extreme weather events. ofi will also evaluate existing financial mechanisms for farmers to invest in regenerative agriculture practices.

In both countries, ofi will monitor data on cocoa yield, price, and premiums to better understand the profitability of cocoa sustainable agriculture practices. All activities are administered through ofi cooperatives at the village (Ghana) or multi-village (CDI) level. Table 3 lists the total number of cooperatives that receive this component of RESTORE, and the number of villages that the farmers of these cooperatives cover.

Since early 2023, 5,014 farm development plans have been generated and 4,469 farmers trained on climate-smart and regenerative agriculture. Also during this period CDI established 2,739 demonstration plots.[14]

Table 3: RESTORE cooperatives and villages covered

Country	Landscape	# of RESTORE cooperatives	# of villages covered by RESTORE cooperatives
CDI	Bossématié	7	33
	South Tai National Park	13	16
Subtotal		20	49
Ghana	Sui River Landscape	2	54
Total		72	112

[13] Also referred to as Youth Service Group in some Activity documentation.
[14] RA. (2023) RESTORE Quarterly performance report: Q23 FY 2023 (April – June 2023)

Strategic Approach 4

Promote and strengthen forest-friendly livelihood diversification through women- and youth-inclusive approaches that improve skills and access to funding, inputs, and markets.

In Ghana in the first quarter 2023, ongoing support was provided to 11 VSLAs and surveys were carried out in 34 communities to identify training needs and potential enterprises to be established. Once beneficiaries were identified in consultation with LMBs, RESTORE provided 122 individuals (including 29 male, 56 female and 37 youth) with start-up kits and technical training on five forest-friendly enterprises (beekeeping, snail rearing, aquaculture, piggery and bakery), as well as management and financial literacy training.

In CDI, SA4 is focused on providing support to Village Savings and Loan Associates (VSLAs) including working with communities to identify women and youth-focused small and medium enterprises to receive technical and material support. In CDI, 3 new communities were identified to establish 6 new VSLAs around the South Tai National Park,[15] and 22 existing VSLAs were evaluated and sensitized for potential to form unions, enhance income generation, and move towards financial independence. 16 of the 22 met the criteria to form unions.

Theory of Change

Initial results chains for each SA and the whole of project were developed during the co-design phase. These results chains were subsequently updated during the RESTORE start-up workshop. The FA team produced simplified versions of these TOC for each SA and flagged logic concerns and significant assumptions. The results chains for each SA are provided below (see Figure 2 through Figure 6), and an overall TOC as listed in RESTORE Year 1 workplan is provided in Annex 1. The TOCs cover RESTORE program as a whole, including both countries. The baseline assessment proposed in this report, is an opportunity to collect evidence regarding these TOC assumptions, to be used in a future Pause and Reflect sessions.

[15] RA. (2023) RESTORE Quarterly performance report: Q32 FY 2023 (AprilJanuary – June March 2023)

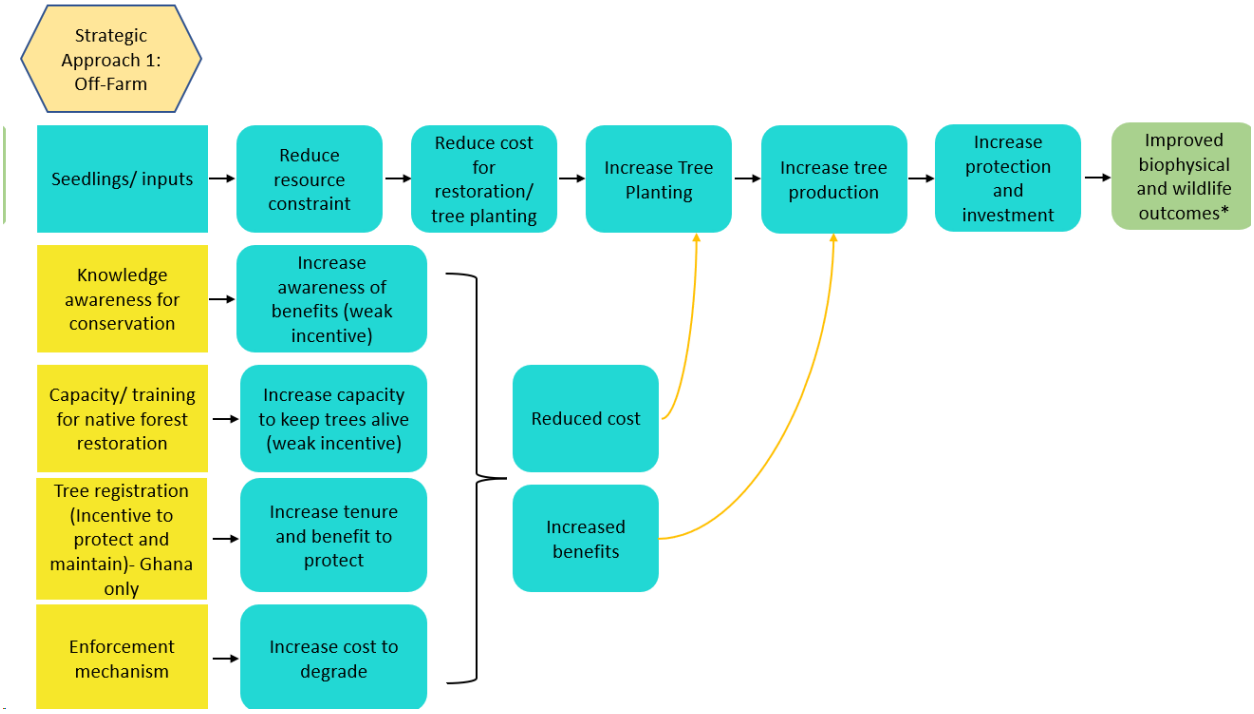

Figure 2. SA1: Off Farm Results Chain

*Programmatic impact on zoonotic disease is anticipated to be limited and excluded from TOCs. It is possible that improved biophysical and wildlife outcomes, including increased biodiversity, may reduce zoonotic risk leading to improved health outcomes in cocoa communities, and the study will capture a limited number of health outcomes.

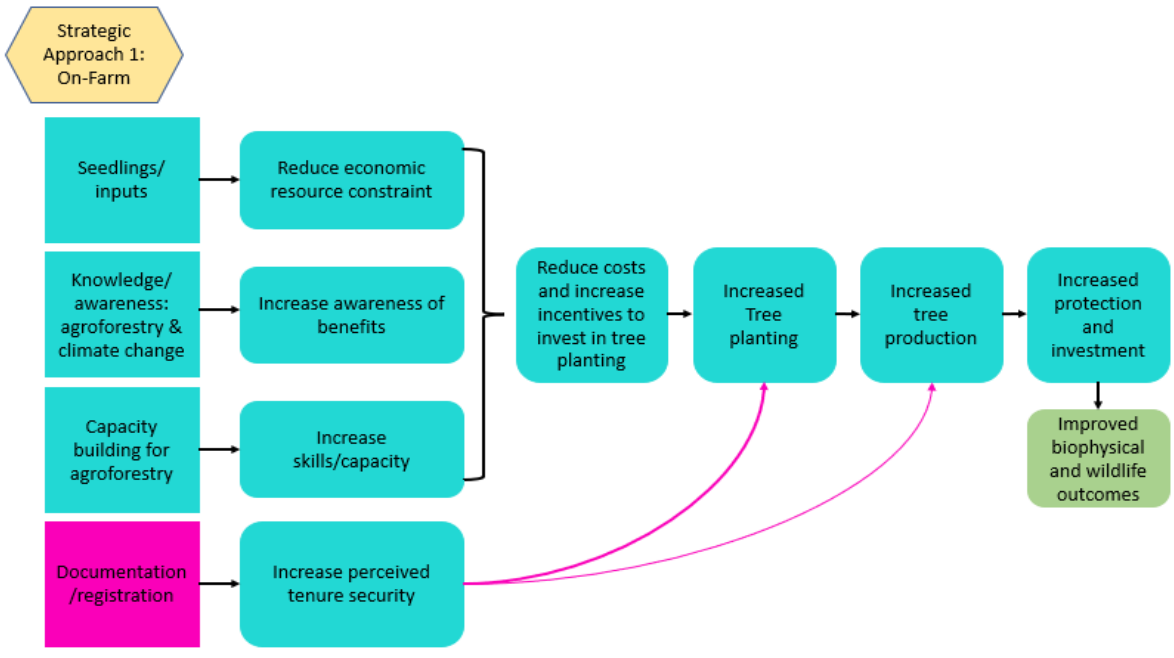

Figure 3. SA1: On Farm Results Chain

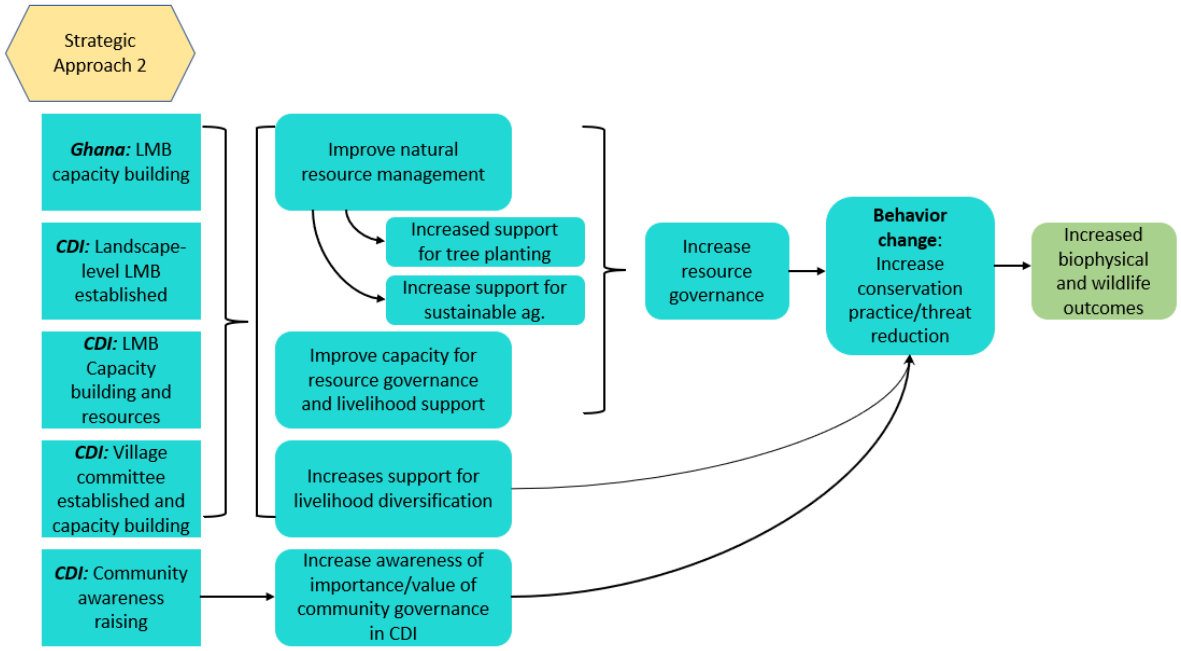

Figure 4. SA2 Results Chain

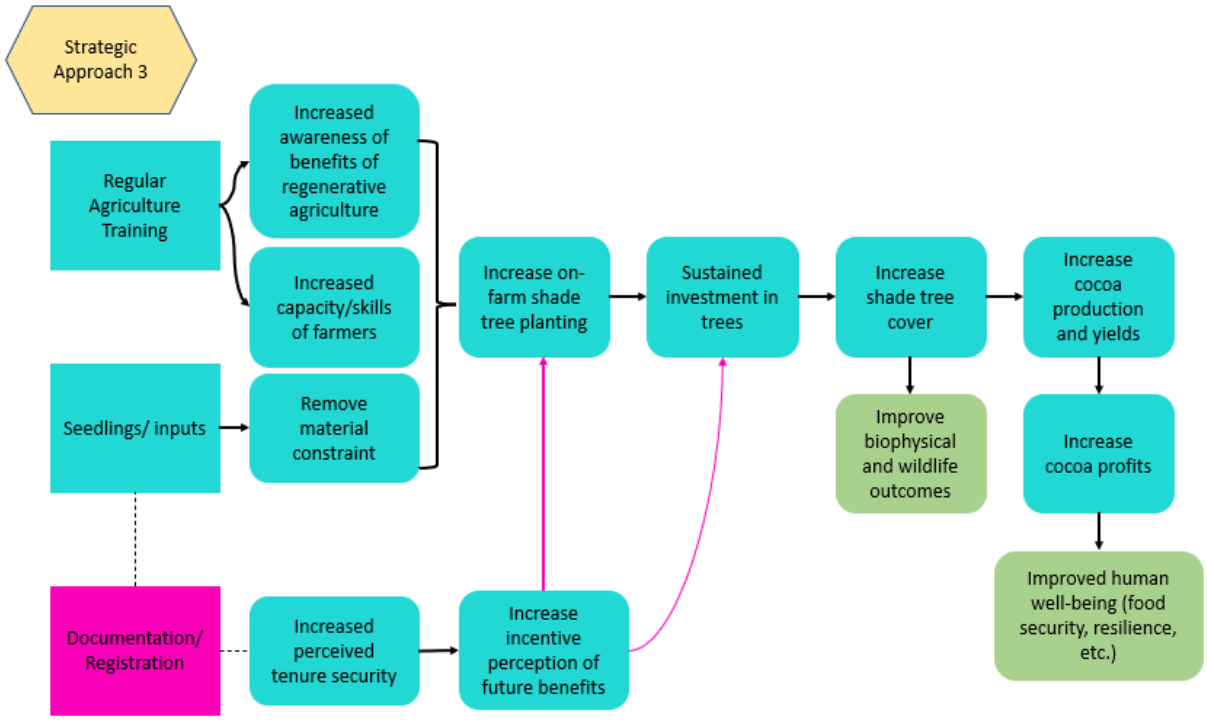

Figure 5. SA3 Results Chain

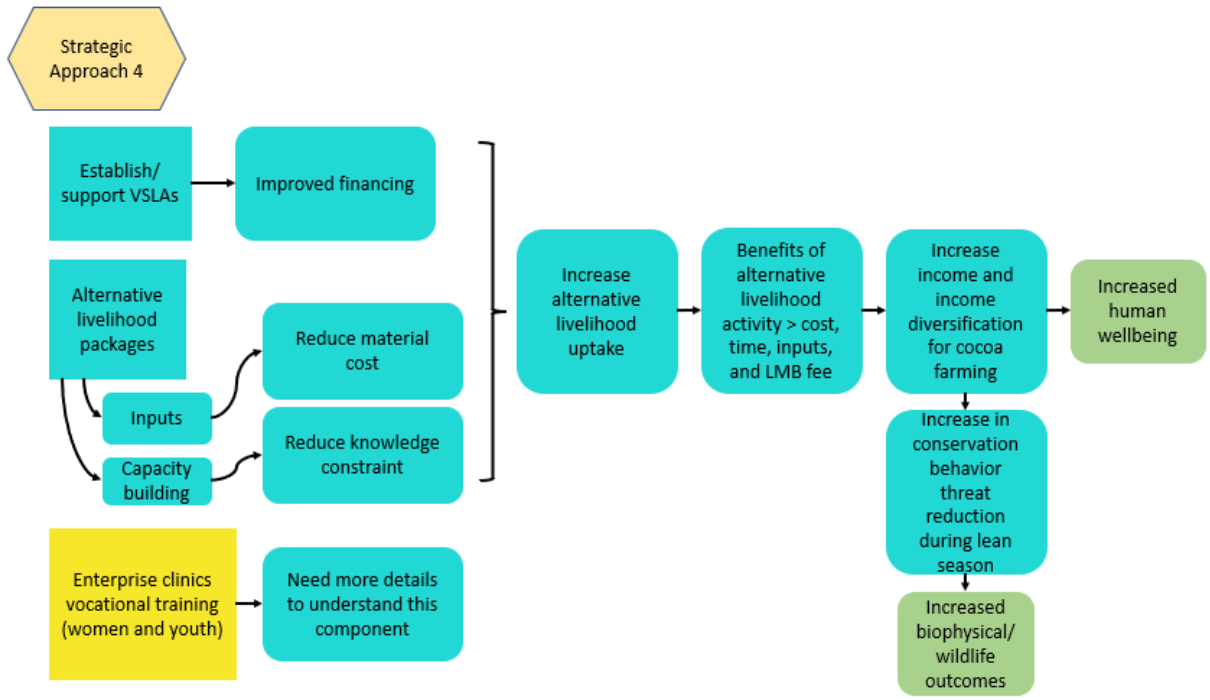

Figure 6. SA4 Results Chain

ZOONOSES TOC

In addition to the RESTORE SA TOCs formed at program design, USAID has asked the ET to consider the implication of RESTORE for zoonotic outcomes and identify opportunities to contribute to the knowledge gap between reforestation efforts and zoonotic disease transmission, given the increased attention to the connection between ecological change and zoonotic disease transmission risk. In general, forest disturbance and land conversion impact the risk factors driving spillover of viruses by increasing exposure of humans and livestock to wild animals. Conversion of natural habitat to agriculture or other land uses leads to: (1) biodiversity loss (Newbold et al. 2015); (2) changes in the distribution and abundance of zoonotic host species (Gibb et al. 2020); (3) increased exposure and increased frequency and intimacy of contact between wildlife (Bloomfield 2020), humans, and domesticated species (Pulliam et al. 2012). Exposure changes through changes in forest use, forest access, influx of agriculture (particularly bridge hosts), wildmeat demand, and wildlife supply. All three of these factors can increase the likelihood of emergence. We include a more detailed discussion regarding the link between conservation programs in general and zoonosis outcomes in Appendix G of the FA report.

We identified four pathways of how RESTORE intervention-related landscape change may increase the risk of zoonotic spillover:

- Habitat conversion changes wildlife range, which changes the density and distribution of reservoir hosts. This subsequently changes hosts' carrying capacity for pathogens.
- Agricultural intensification can lead to habitat conversion and change resource availability for different animals; in some cases, this might improve conditions for some animals and decrease available food/shelter resources for others.

- Habitat conversion can be stressful for wildlife; stress reduces immune response and leads to increased pathogen prevalence and loads. This results in increased levels of pathogen release and excretion.
- Reduced/shared resources can increase interspecies contact, promoting pathogen exposure, spread and survival. On the other hand, the creation of bio corridors or connectivity patches might affect the human-host interaction due to increased presence of wildlife.

The realization of these spillover effects is anticipated to be more prominent in Ghana with the restoration of off-farm forested areas. As off-farm interventions in CDI were originally restricted to boundary planting,[16] the ET does not expect RESTORE interventions to induce significant landscape change thus zoonotic disease risk change in CDI. However, it is possible that use of native species in rural areas, where native species had been especially depleted, will lead to increased presence of some animals and may have downstream effects on human-wildlife contact both on- and off-farm. The baseline assessment will track habitat diversity at the start of RESTORE which can be used to inform assumptions underlying the RESTORE/ecological connection.

Key Assumptions

The ET team notes several strong assumptions underlying the RESTORE SA TOCs regarding the strength of the incentives provided by program activities in motivating sustained tree planting, management and conservation, and decreased land clearing at the farm and community level.

- In CDI, there is an assumption that awareness of conservation importance combined with governance support for Village Committee and LMB resource management will lead to sustained management of boundary trees.[17] RESTORE assumes that primary barriers to off-farm tree planting and preservation include lack of inputs and conservation awareness, and a lack of market opportunities for other non-cocoa activities, hindering degradation. There is weak existing evidence that training and start-up costs alone lead to sustained adoption for regenerative agriculture practices; increased awareness and training on native tree planting and community governance does not address the financial, coordination, and political barriers to promote a commitment to restoration.
- In CDI, the off-farm planting currently planned is village boundary planting of native trees, planted 20 meters apart in a single row. The ET recognizes that while native tree planting in rural areas, where native species had been especially depleted, may lead to certain local ecological changes with increased presence of some animals, as well as increase carbon capture. However, boundary planting alone is not likely to lead to landscape-level biodiversity changes.
- There is an assumption that native/shade trees will lead to short- or long-term yields and profits which outweigh the cost of adoption (planting and change in management practice).
- There is an assumption that improved on-farm productivity will meet farmers' needs and will not motivate expansion and further land clearing.

[16] Since this Design Report was developed 4.36 hectares were designated as a community forest in CDI.
[17] For Ghana, there is a stronger incentive present in tree registration.

- There is an assumption that alternative livelihood options for women and youth will lead to enough sustained income generated, and perceived future security of said income, to reduce dependency on cocoa income and the pressure to expand cocoa farmland.

Learning Agenda

The following section first describes the high-level evaluation questions guiding the overall RESTORE evaluation design, and how the evaluation help address key questions from the HEARTH Learning Agenda. Then, we present the Learning Agenda specific to each SA.

High-Level Evaluation Questions

At a high-level, USAID is interested in better understanding the impacts of each SA on human well-being (socio-economic status, food security, health, etc.) and reducing threats to habitats and wildlife, and thus improving biodiversity and conservation. Below is a set of simplified core questions that were used to inform the evaluation design.

To what extent does each SA (or combinations of SAs):

- Decrease stress on/reduce threats to biodiversity and improve biophysical conditions?
- Change behaviors and norms around conservation?
- Affect livelihoods,[18] well-being, and rural poverty? [19]
- Affect health outcomes (such as likelihood of contracting Malaria, African swine flu, and Onchocerciasis)?
- Have differential effects, including negative externalities, for certain subgroups (such as women, youth, and those in extreme poverty)?
- Achieve sustainable outputs/outcomes/impacts?

Current State of the Evidence

There is significant variation in the rigor of studies about the effectiveness of conservation programming, and weaknesses have been well-documented in the literature. Many studies on the effectiveness of conservation strategies involve simple monitoring of indicators or case studies (Ferraro and Pattanayak, 2006). To date, IEs are rare in conservation science, and this is especially true for efforts to assess the effects of programming on both conservation and poverty reduction, with limited and methodologically weak efforts to assess poverty outcomes relative to measuring forest conditions (Samii et al., 2014). Strong evidence has a patchy geographic distribution, and many studies lack long term outcome

[18] Livelihoods include the means or methods that households engage in to earn a living or otherwise meet their basic needs. Livelihoods may be affected by the RESTORE activity in a variety of ways, including by making existing livelihoods less extractive, shifting to new/different livelihood activities (e.g., engaging in tourism rather than charcoal production), and/or increasing income from existing or new livelihood activities.

[19] Well-being and poverty are multi-dimensional and include socio-economic status as well as other outcomes like resilience, food security, health, education, and other aspects of quality of life.

measurements and/or focus on only a single outcome—forest cover change. See below a short summary of current evidence regarding the effects of conservation policies and refer to the FA report for more details.

Forest Restoration. The quantitative evidence on natural forest restoration outcomes, in general, is sparse, with particularly insufficient study to examine how social context affects the diversity and abundance of regenerating trees, and how this, in turn, influences ecosystem function and livelihood benefits (Chomba et al., 2020). To-date, there is no counterfactual evidence on the impact of restoration interventions on social or ecological outcomes. This makes it difficult to determine where and for whom forest restoration and similar nature-based solutions are an appropriate intervention technique. Wildlife conservation through the protection and restoration of ecosystems has the potential to reduce zoonotic spillover (Sokolow et al. 2019; Reaser 2020; Plowright et al. 2021), but this concept has yet to be demonstrated on a large scale in a real- world setting. Data examining the outcomes of such efforts is currently absent, although reforestation or restoration are core components of many countries' climate change mitigation commitments.

On-Farm Cocoa Agroforestry. Cocoa agroforestry systems, relative to cocoa monocultures, have demonstrated success in increasing cocoa yields and productivity.[20] However, cumulatively, the evidence available on the various impacts of cocoa agroforestry interventions is not extensive (Tolisano et al., 2022). There are particularly significant research gaps in verifying the economic and financial analysis of agroforestry models, especially those affecting the food security concerns of indigenous communities; additional research on nutrition, food security, and environmental outcomes is needed. Equity concerns of agroforestry interventions appear in many of the studies, and results are mixed, indicating that additional consideration of equity in agroforestry interventions is needed.

Tenure Security. Despite a widely held expectation that tenure security can improve incentives for conservation, counterfactual studies linking tenure security to conservation outcomes has been sparse (Tseng et al., 2021) and mixed (Lisher and Huntington, 2023). This empirical literature has grown as donors have funded tenure reform programs in a variety of contexts that offer the opportunity to measure the effect of interventions to strengthen tenure on forest outcomes with quasi-experimental methods. The growing literature has found positive effects on forest cover on average, but results have varied widely by context (Tseng et al., 2021) and the type of tenure under investigation (Robinson et al., 2014), leaving open the question of how the relationship between tenure and forests might be mediated by tenure form, context, geography and institutional factors.

Alternative Livelihoods. There is an absence of rigorous empirical evidence about the impact of alternative livelihood programs on conservation outcomes. To incentivize behavioral changes to improve conservation and reduce threats to biodiversity, conservation organizations have made significant investments in alternative livelihood initiatives including conservation enterprises and public-private partnerships to improve market linkages (Roe et al., 2015). However, rigorous evidence for positive impact on outcomes related to conservation, well-being and biodiversity is lacking. As a result, an

[20] Findings hold for up to 30 percent tree cover in well-managed agroforestry systems. Beyond 30 percent, or under poor management, yields can be compromised (Blaser, et al., 2018).

evaluation of RESTORE would present an important opportunity for the first (or one of the first) counterfactual-based studies of alternative livelihood programming.

LEARNING QUESTION SPECIFIC TO EACH STRATEGIC APPROACH

RESTORE will have implications for all four of the intervention techniques reviewed above, and our team formed the RESTORE key learning questions (LQs) associated with each SA in consideration of current evidence noted above, the FA scope of work, TOC, program documents and in consultation with USAID and IPs.

STRATEGIC APPROACH 1

- How are different types of farmers and landowners incentivized to promote good conservation practices? Types of farmers to consider are farmers of high and low affluence, farmer land tenure types (sharecropping, abuna, abusa, rent), farmer immigrant status, farm proximity to protected areas/forests, and age of farms.
- Have land and/or tree tenure arrangements effectively encouraged conservation practices? If yes, which incentive package(s) have been effective in promoting conservation practices? And to which subpopulation? Incentive package components to consider include secured tenure arrangements, sensitization about socioeconomic and environmental benefits of shade trees, perception of farmers regarding climate vulnerability, high demand for cocoa volumes and strong presence of traders, biologically and socially preferred tree species, and economic incentives such as premiums and access to materials.
- If the enabling policies and access to materials are put into place, which trees will farmers plant and with what purpose (shade, timber, additional tree crop)?
- Does improved community understanding of ecosystem benefits and trade restrictions lead to deliberate efforts towards reducing threats to biodiversity (forest degradation, deforestation, mineral extraction, agrochemical usage, poaching)?
- Do on- and off-farm tree planting efforts lead to sustained impact on increased flora and fauna[21] biodiversity of critical ecosystems and species in the RESTORE treatment areas? On water quality and quantity in the RESTORE treatment areas? And on zoonotic disease risks to neighboring communities?

STRATEGIC APPROACH 2

- Does the participatory landscape governance process give women and youth voice and influence in decision-making, especially in Farmer Groups and village organizations?
- Have capacity-building interventions been effective at strengthening LMBs, Farmer Groups, and village organizations? If yes, which ones? Why or why not?
- Have landscape stakeholders contributed towards strengthening LMBs, Farmer Groups, and village organizations to be effective in delivering their mandate? How do results vary by engagement methods?

[21] Including flora and fauna that benefit cocoa and food crop systems, as well as native species (flora and fauna) without a direct benefit.

- Have bottom-up governance approaches designed by the LMBs been effective in promoting sustainable landscape management? If yes, which governance approaches have been the most successful? Is this approach scalable?
- Has collaboration between the private sector and the communities yielded positive synergies in improving the livelihoods of community members?

Strategic Approach 3

- What are the priority factors determining the adoption of regenerative, sustainable cocoa farming? What are the most and least easily adopted practices of regenerative agriculture by farmers, and why? Are there government policies that conflict with regenerative agriculture?
- Does regenerative sustainable cocoa production contribute to a reduction in threats to biodiversity, and if so, through which mechanisms?
- Does regenerative sustainable cocoa production enhance ecosystem services important for agriculture (e.g., pollination, soil fertility, water quality and quantity)? What impact does this have on household food security and health, if any?

Strategic Approach 4

- Has RESTORE motivated women and youth entrepreneurs to start up enterprises? If yes, what has been the most important market and/or contextual factor in motivating women and youth entrepreneurs to initiate enterprises?
- Have women's and youths' livelihoods improved as a result of diversification approaches?
- Have long-term investment portfolios been initiated as a result of landscape partnerships?
- Which investments potentials provide the most sustained income stream to the landscape? Do diversified income sources for forest fringe communities reduce threats to biodiversity through reduced pressure on natural habitats and forests?

LINK TO HEARTH LEARNING AGENDA

The ET reviewed the HEARTH Learning Agenda,[22] and identified how RESTORE will address overall USAID HEARTH learning questions 2 – 5 (see Table 4).

Table 4: USAID HEARTH Learning Agenda Questions

Learning Question
LQ2: CROSS-SECTORAL BENEFITS: Under what conditions does the HEARTH model contribute to enhanced well-being (e.g., health, food security, equity, cultural and spiritual well-being) and economic prosperity of local communities?
LQ3: ATTITUDE AND BEHAVIOR CHANGE: Under what conditions do the benefits from the HEARTH model result in changes in conservation attitudes and/or behaviors of community members or private sector actors?
LQ4 THREATS REDUCED: Under what conditions do changes in community member or private sector actors' behaviors contribute to measurable reductions in threats to biodiversity and carbon-rich ecosystems?
LQ5: HUMANS AND NATURE: Under what conditions does connecting conservation to community well-being lead to sustained benefits for humans and nature?

The RESTORE focus on cocoa agroforestry adoption, linked with landscape level conservation effort, echoes the HEARTH central idea that conservation and cross-sectoral well-being of the community is a mutually enforcing process (LQ5). As a whole, the RESTORE learning questions for SA 1 and 3 tests the approach of promoting cocoa agroforestry and climate smart agriculture (CSA) practices for congruent improvement in economic and ecological outcomes at the household and community level. Over time, RESTORE can provide an understanding of how economic incentives provided through CSA influence farming communities' conservation attitudes and efforts, and how it then in turns reenforces the upholding of CSA principles.

RESTORE learning questions related to effectiveness of on- and off-farm conservation practice adoption directly contributes to HEARTH Learning Agenda LQ3 of what incentives changes conservation attitudes and behavior in agricultural landscapes. The RESTORE interventions address incentives to adopt conservation behavior on-farm (shade-tree and CSA practices) and off-farm (tree-planting and restoration management) through providing incentives at the household level (information and capacity, income from improved cocoa yields, income from alternative livelihoods, and tenure-related incentives) and at the community level (community-level tree planting support and Landscape Management Boards). The adoption of these conservation practices offers opportunity to then test the assumption that adopting these practices can improve cross-sectoral community wellbeing (Learning Agenda LQ 2), including economic well-being, food security, and health-welling.

[22] Gorospe, K.D. 2022. USAID's HEARTH Learning Agenda. United States Agency for International Development: Washington, D.C. 10pp.

Aside from these questions focused on household and community-level decision-making and outcomes, the landscape-level focus of RESTORE, and the connection between on-farm and off-farm tree planting efforts, particularly offers a unique opportunity to investigate the landscape-level processes between ecological well-being and human's cross-sectoral well-being pertaining to Learning Agenda LQ4 and LQ5. These processes include whether changes in conservation attitude and/or economic well-being on cocoa-intensive farm areas spills over to threat reduction in areas closer to forest reserves, and whether improvement in ecological health at the landscape level leads to improved human health.

Evaluation Design

The ET developed two mixed-methods evaluations[23] for RESTORE, one for each country. Although the evaluation design is different for each country, combined, they answer similar Learning Questions, and contribute to knowledge about RESTORE as a regional activity. The design allows the ET to assess the effect of each of the SAs using the most rigorous method available. Because the unit of implementation is different for each SA (e.g., individual versus community level), and implementation details for most SAs are slightly different between countries, the ET proposes either an IE, a rigorous PE or a case study for each SA in each country. Table 5 summarizes the evaluation design for Ghana and CDI respectively.

Table 5: RESTORE evaluation design by country

Program Component	Ghana	CDI
SA1: Off-farm planting	IE Difference-in-Differences	IE Difference-in-Differences
SA1: Tree (Ghana) or Village land Registration (CDI)	IE Difference-in-Differences(*)	Rigorous PE (with comparison group)
SA2: LMBs (and village committees for CDI)	Rigorous PE (with comparison group)	Rigorous PE (with comparison group) (village committees) PE + Case study (LMBs)
SA3: On-farm agroforestry	Rigorous PE (with comparison group)	Rigorous PE (with comparison group)
SA4: Alternative Livelihood	IE Difference - in - Differences(*)	Rigorous PE (with comparison group)

*To conduct a difference-in-differences IE for SA1 Tree Registration and SA4 Alternative Livelihood in Ghana, beneficiaries must be known in advance of baseline data collection to ensure sufficient sampling of the beneficiary population. If this information is not available at baseline, these will instead be evaluated through a rigorous PE with a comparison group.

[23] A mixed-method evaluation integrates two or more evaluation methods, usually drawing on both quantitative and qualitative data. Mixed-method evaluations may use multiple designs and different data collection techniques such as structured observations, KIIs, household surveys, and reviews of existing secondary data. Mixed methods designs can strengthen an evaluation by (1) using different methods to answer different evaluation questions, or (2) using different methods to answer the same questions (increasing confidence in the validity/reliability of results). Generally, mixed methods evaluations can provide a deeper understanding of why change is/not occurring and capture a wider range of perspectives.

The following sections provide a brief overview of the IE and PE approaches that will be used across Ghana and CDI. Afterwards, we dive into the specific evaluation approach, treatment and comparison group identification process, analysis approaches, and statistical power analysis for each of evaluation components, first for Ghana then for CDI.

Overview of Evaluation Approaches

IEs measure the causal impact of a program - in other words, the difference in outcomes attributable to the program rather than other external factors. For RESTORE, the IEs apply to the off-farm planting component for both countries (SA1). In addition, the village tree registration (SA1), and alternative livelihood component (SA4) in Ghana may also be conducive to an IE approach, but only if beneficiaries are identified by the time of baseline data collection (for CDI it was confirmed that Alternative Livelihood beneficiaries would not be known in time). For off-farm planting, the ET will utilize a quasi-experimental difference-in-differences approach, with program and comparison sites matched on ecological and socio-environmental characteristics. The ET will compare the change in ecological and social outcome between matched sites. Matching will be used to strengthen identification for the difference-in-differences (DID) analysis by helping mitigate observable differences between treatment and comparison locations.

The rigorous PEs will include the same quasi-experimental approaches that will be utilized for the IEs, as well as non-experimental approaches (such as before-after comparisons) that can answer descriptive questions about differences but cannot attribute causality with the same degree of rigor or confidence. The PEs cannot attribute causality with the same degree of rigor or confidence for several reasons: 1)The comparison groups for the PEs may be less than ideal than the IEs, more likely having systematical differences from the program groups, or 2) the rigorous PE approach is used instead of an IE because of small sample size or staggered intervention, underpowering the design and making it more difficult to capture treatment effects.

For the IE, and rigorous PEs, qualitative data including Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) will be collected from representative samples of individuals, communities, and key stakeholders to interpret quantitative data analysis results, and to stand alone as its own source of evidence for all evaluations.

GHANA EVALUATION DESIGN

Table 6 provides an overview of the Ghana evaluation design including the unit of implementation, the proposed method, and the identified comparison group. Data collection, including methods and outcomes of interest are covered under data collection below.

Table 6: Ghana Evaluation Design

Program Component	Unit	Method	Comparison group(s)
SA1: Off-farm planting	Village/ Ecological Sites	IE Difference-in-Differences	RESTORE (54 sites) to non-RESTORE (P4F)(1) (52)
SA1: Tree registration	Individual	IE Difference-in-Differences(*)	Recipient to non-recipient individuals within RESTORE *or* RESTORE (54 villages) to non-ofi (~50 villages) individuals
SA2: LMB	Village	Rigorous PE (with comparison group)	RESTORE to non-ofi
SA3: On-farm agroforestry	Individual Village/ Select farm plots	Rigorous PE (with comparison group)	RESTORE to non-ofi
SA4: Alternative livelihood	Individual	IE Difference-in-Differences(*)	Recipient to non-recipient individuals within RESTORE *or* RESTORE to non-ofi individuals

(*) Requires identification of beneficiaries prior to baseline. If this is feasible, individuals within RESTORE will be compared. If prior identification is not feasible, RESTORE sites will be compared to non-RESTORE locations.
(1)P4F sites are other ofi sites outside of the RESTORE program which will not receive off-farm planting.

TREATMENT/COMPARISON GROUP IDENTIFICATION

SA1: Off-farm planting. In the Sui River landscape in Ghana, RESTORE operates in 54 villages to the east of the Forest Reserve. In addition, ofi operates in around another 40[24] villages near RESTORE areas as part of the Partnership for Forest (P4F) program. P4F villages receive the same on-farm agroforestry support (SA3) as RESTORE locations but are not included in the off-farm restoration planting (SA1). The off-farm restoration (SA1) is implemented in RESTORE villages that expressed interest in restoration and identified communal or proffered private land for the intervention. As of the May scoping trip, approximately 20 treatment villages had expressed interest in finding community or private forest land for restoration. During the 2023 September scoping trip, 40 hectares had been confirmed for the off-farm restoration in a subset of the 20 villages that had initially expressed interest. The ET understands that additional areas might be added to the total area for restoration, however, in this design report we are working under the assumption of the confirmed 40 hectares, which covers a handful of villages. Among the 40 P4F villages, ET will select a subset of villages and ecological sites similar to the RESTORE villages undertaking the confirmed off-farm planting, to serve as the comparison

[24] This figure is anticipated to expand over the period of the evaluation to the 52 sites noted in Table 6. If additional sites are not identified prior to baseline, the ET will utilize the current 40 sites in sampling.

group for off-farm restoration component. The social outcomes will be evaluated under a rigorous PE framework, due to the small sample size. The ecological outcomes will be evaluated under a quasi-experimental IE framework.

SA2: LMBs & SA3: On-farm agroforestry. Ofi cooperatives in Ghana are organized at the village level, and in each RESTORE village, the IPs established one LMB per village (SA2). The on-farm agroforestry (SA3) is implemented through the ofi cooperatives at the landscape level. The main challenge in Ghana with identifying comparison groups for these activities is the saturation of cocoa-agroforestry programs. The ET identified an area on the west side of the Sui River forest reserve where we believe no agroforestry programs are currently being implemented. However, it is likely that it is because these villages (described in the table above as non-ofi villages) are systematically different from the villages that do receive ofi or other agroforestry programming. One known difference is that these villages do not have LMBs. Another is that they are not as close to the forest, thus may not be a source of pressure on the forest, and therefore the opportunity for restoration (or avoided deforestation) is reduced. The ET will select around 50 non-ofi villages to serve as comparison group for LMBs (SA2) and on-farm agroforestry support (SA3). The baseline evaluation will collect data on the characteristics of these villages and confirm whether they are systematically different from the ofi villages. These components are evaluated under a rigorous PE framework, due to the non-ideal characteristics of comparison group, which the ET plan to use qualitative approaches to understand how these systematic differences may affect interpretation of program effects.

SA1: Tree Registration & SA4: Alternative Livelihoods. The tree registration (SA1) and alternative livelihood (SA4) components will be administered at the individual level. If the recipients are identified prior to baseline collection, the ET team can evaluate the program components at the individual level within RESTORE villages (comparing those who did and did not receive the program), using a quasi-experimental IE approach. However, if the beneficiaries are not identified at baseline, the ET team will evaluate the components at the village level, similar to the on-farm agroforestry support. This approach would utilize a rigorous PE framework by comparing changes in outcomes between RESTORE villages and non-ofi villages keeping in mind that these non-ofi locations may have systematic differences at baseline.

Analysis Overview

This section details the analysis approach for the proposed designs. More information can be found in the Analysis Plan section of this report. There will be three primary analysis approaches, depending on the method, which will be used to answer the learning questions:

- **Analysis for IE DID of off-farm planting (SA1):** Before-after comparison of changes in off-farm ecological outcomes (see Ecological/biodiversity outcomes below) between off-farm ecological sites and comparison locations. Sites will be matched by baseline ecological characteristics. Social outcomes and socio-environmental interactions will be measured through household and community leader surveys.
- **Analysis for IE DID for tree-registration (SA1) and alternative livelihood (SA4):** Assuming beneficiaries can be identified in advance, the ET will conduct a before-after comparison of changes in livelihood and resource use/attitudes between individuals/households

participating in these activities and other individuals/households within their communities. Matching will be based on individual characteristics with data pulled from baseline social surveys (see Human and Social data collection below). If beneficiaries cannot be identified in advance, analysis of these SA and their associated learning questions will fall under the Rigorous PE approach.

- **Analysis for Rigorous PE (with comparison group) for LMBs (SA2) and on-farm agroforestry (SA3):** Before-after comparison of on-farm ecological outcomes from ecological data collected at sampled cocoa farms and social outcomes from social surveys in RESTORE and non-ofi locations. This approach will be used for tree-registration (SA1) and alternative livelihoods (SA4) if beneficiaries cannot be identified in advance for individual-level analysis.

Qualitative data (FGDs and KIIs) will be used to supplement analysis across SAs.

COTE D'IVOIRE EVALUATION DESIGN

Table 7: CDI Evaluation Design

Program component	Unit	Method	Comparison group
SA1: Off-farm boundary planting	Village	IE Difference-in-Differences	RESTORE (~49 villages) to non-RESTORE (~49 villages)
SA1: Village land registration	Village	Rigorous PE (with comparison group)	RESTORE to non-RESTORE Within RESTORE (varying levels of registration
SA2: LMBs/village committee	LMBs	PE + Case study	none
	Village Committee	Rigorous PE (with comparison group)	RESTORE to non-RESTORE
SA3: On-farm agroforestry	Village	Rigorous PE (with comparison group)	RESTORE to non-RESTORE
SA4: Alternative Livelihoods	Individual	Rigorous PE (with comparison group)	RESTORE to non-RESTORE

TREATMENT/COMPARISON GROUP IDENTIFICATION

SA1: Off-farm boundary planting & Village Land Registration. In CDI, RESTORE operates in 60 villages, 49 of which will receive boundary planting. The village land registration and village boundary planting (SA1) are administered at the village level, with each village at a different stage of the registration process. For example, IPs noted that AFOR has identified several villages nearby RESTORE villages to delimit and undertake boundary planting, but which are delayed due to resource limitations. These villages will serve as the comparison group for SA1.[25] The *village land registration* component will be evaluated under a rigorous PE framework because the villages are at varying levels of registration

[25] Comparison villages are likely to be different than villages further along in the registration process, introducing selection bias. See more under Limitations, Risks, and Mitigation.

(with most starting registration prior to RESTORE). This allows the ET to compare outcomes within RESTORE villages (at various stages) and between RESTORE and comparison locations.

SA2: LMBs/Village Committees.[26] Each RESTORE village will have a village committee, but LMBs are at the landscape level (SA2). As the LMBs operate at the landscape level, there are only two LMBs with no potential comparisons. Thus, they will be evaluated under a PE and case study framework. The village committee will be evaluated under a framework similar to on-farm agroforestry programming (SA3) noted below to examine differences between treatment and comparison locations. In addition, if variation exists in how the committees are established and structured between RESTORE villages, that intra-RESTORE variation will also be examined as part of this evaluation.

SA3: On-farm Agroforestry. The on-farm agroforestry support (SA3) is administered through the ofi cooperatives. Ofi cooperatives in CDI contain farmers representing several nearby villages. As with Ghana, the challenge with identifying comparison groups in CDI is the saturation of cocoa-agroforestry programs. The ET was not able to identify any areas on the landscape not receiving agroforestry assistance from other programs. Therefore, villages identified as comparisons for the off-farm boundary planting will be utilized here as well. Because of the saturation of agroforestry programs these villages provide imperfect comparison sites, and this component will be evaluated under a rigorous PE framework.

SA4: Alternative Livelihoods. Alternative livelihood beneficiaries will be identified through a participatory process through the LMBs and financial and technical support supplied to select individuals in program villages (SA4). The ET learned that the beneficiaries for SA4 will not be identified by baseline in CDI and this component will be evaluated similar to the on-farm agroforestry support component. Using a rigorous PE framework, the ET will compare changes in outcomes between RESTORE villages and non-RESTORE villages.

Analysis Overview

This section details the analysis approach for the proposed designs. There will be four primary analysis approaches, depending on the method, which will be used to answer the learning questions:

- **Analysis for IE DID of boundary planting (SA1):** Comparison of before-after between program sites and comparison sites, of off-farm ecological outcomes from data collection at sampled ecological sites.
- **Analysis for Rigorous PE of land registration (SA1) and village committees (SA2) (with comparison group):** Comparison of before-after social outcomes between program villages and comparison villages (villages AFOR plans to work in in the future). Within program variation will also be examined for villages at different levels in the registration process (SA1). LMBs (SA2) will not have a comparison but instead be analyzed as a stand-alone case study.

[26] Village committees in CDI are comprised of representatives from existing associations in landscape management. Examples include: Comités Villageois de Gestion Foncière Rurale (Village Land Committee) which was set up by AFOR to manage only land tenure issues in each village and AVCD set up by OIPR to support park/reserves. Each association has a specific landscape management focus that, when brought together, comprise the village committee.

- **Analysis for Rigorous PE of cocoa-agroforestry (SA3) (with comparison group):** Comparison of before-after social outcomes between program villages and comparison villages. In addition to social outcomes, of on-farm ecological outcomes will be captured at sampled cocoa farms.
- **Analysis for Rigorous PE of alternative livelihood (SA4) with comparison group):** Comparison of before-after between program villages that have alternative livelihood component and villages that do not have this component with RESTORE (as applicable), and between program villages and non-program villages.

Qualitative data (FGDs and KIIs) will be used to supplement analysis across SAs.

POWER ANALYSIS

The ET conducted power calculations to determine the minimum detectable effect sizes—the smallest program impact that the evaluation can confidently detect through statistical analysis—for different sample sizes and evaluation design options. Power analysis for the household-level livelihood, resource-use and conservation behavior and attitudes uses a clustered design, as the sampling approach for household data collection will be clustered at the village level. Below presents a power analysis for the main DID analysis of household-level outcomes, accounting for how similar households will be within a cluster.[27] Our main specifications will be to compare the ~50 RESTORE villages in each country to ~50 comparison villages, with different comparison villages at times for difference intervention components. Thus, we use 5 villages in each arm for the power analysis and specified a cluster size of 12 or 15 households per villages.

Overall, statistical power calculations show that the study is powered to detect reasonable effect sizes of around 0.24 to 0.33 standard deviations for continuous outcomes, under assumptions of 0.1 to 0.3 Intra-Cluster Correlation (ICC) parameter (effect sizes of 0.20 standard deviations are generally considered small, up to 0.5 moderate, and 0.8 and above are considered large).[28] Increasing the cluster size from 12 to 15 makes little difference in the power of the design. For binary outcomes, such as adoption of agroforestry techniques, a design of 50 clusters and 12 households per cluster is powered to detects a 3 to 5 percentage point change for outcomes that are not present at all in the population at baseline, to a 12 to16 percentage point change for outcomes that are already present among 50 percent of the population at baseline.

[27] The ICC coefficient measures the relatedness/similarity of responses within a cluster. The higher the coefficient, the more similar households are within a community on key characteristics or outcomes and the higher the required sample size. We conducted the power analysis assuming an ICC of 0.1, 0.2 and 0.3.

[28] Cohen, J. (2016). Things I have learned (so far). In A. E. Kazdin (Ed.), Methodological issues and strategies in clinical research (pp. 265–276). American Psychological Association. https://doi.org/10.1037/14805-017

Table 8: Power calculation for continuous outcomes

Number of Clusters	Size of Clusters	ICC	Effect Size (Standard Deviation)
50	12	0.1	0.24
50	12	0.2	0.29
50	12	0.3	0.33
50	15	0.1	0.23
50	15	0.2	0.28
50	15	0.3	0.33

Table 9: Power calculation for binary outcomes

Number of Clusters	Size of Clusters	ICC	Baseline Proportion	Minimal Detectable Effect Size
50	12	0.1	0	0.03
50	12	0.2	0	0.04
50	12	0.3	0	0.05
50	12	0.1	0.2	0.10
50	12	0.2	0.2	0.13
50	12	0.3	0.2	0.15
50	12	0.1	0.4	0.12
50	12	0.2	0.4	0.14
50	12	0.3	0.4	0.16
50	12	0.1	0.5	0.12
50	12	0.2	0.5	0.14
50	12	0.3	0.5	0.16

Outcomes and Data Collection

Data used for the evaluations will come from two principal sources: quantitative and qualitative social data, and species/biodiversity monitoring data. Baseline data collection varies slightly by country but largely includes the following for social data collection: (1) settlement listing to construct a sampling frame for quantitative data collection; (2) quantitative surveys including a household survey, spousal survey, community leader survey, and LMB/village committee survey; and (3) qualitative data collection including KIIs and FGDs. Ecological data collection includes measurements of: (1) Forest quality; (2) Biodiversity (Species richness and species abundance of key species important to habitat and zoonosis disease transmission); (3) Entomological survey (especially pollinators and mosquitoes); (4) Water quality; and (5) Soil quality. Endline data collection is anticipated for 2027 and a long-term follow-up for 2032.

The following sections first review human and social outcomes to be captured by the evaluation and the data collection approach followed by the same information pertaining to the ecological/biodiversity outcomes.

Human and Social Outcomes and Data Collection

Table 10 below includes the human well-being outcomes that will be measured through quantitative surveys as part of the RESTORE evaluation in both Ghana and CDI. For more details on the potential indicators, please reference the detailed guidance and Performance Indicator References Sheets in the HEARTH Monitoring and Evaluation Toolkit.[29] These indicators are not linked to any one SA, but rather are anticipated to be relevant across the RESTORE Activity project areas and interventions. These indicators will be disaggregated by gender, socio-economic status, and age and supplemented through qualitative data collection efforts.

Table 10: Human and social outcomes and indicators

Outcome Type	Illustrative Outcomes	Potential Indicators
Food Security and Nutrition	Dietary diversity	Percent of women of reproductive age consuming a diet of minimum diversity (MDD-W)
	Improved individual or household food security	Percent of households experiencing moderate and severe food insecurity, based on the Food Insecurity Experience Scale
	Reduction of potential exposure to zoonotic diseases	Percent of households consuming high-risk wild meat in the past year
Health	Health	Percent of children under five with diarrhea in the past two weeks

[29] USAID, "HEARTH Monitoring and Evaluation Toolkit," (2022): https://pdf.usaid.gov/pdf_docs/PA00ZBDF.pdf.

Outcome Type	Illustrative Outcomes	Potential Indicators
Education	School attendance	Household reports of school absenteeism and attendance
	Educational outcomes	Grade level completion and ability to read and write – with a focus on children's outcomes
Conservation Knowledge, Attitudes, and Practices	Improved knowledge and attitudes towards conservation and natural resource management	Average score measuring the perceived importance of protecting nature and the environment
	Reduced unsustainable use of resources	Percent of households who engaged in unsustainable use of ecosystem resources in the past year; percent of households that cleared land for cultivation in the past year
Governance	Tenure Security	Indicators for household understanding of boundaries, perception of right to use and access forests / trees
	Locally derived rules	Household reports of local/community rules around forest use and management
	Participatory decision-making	Household and community leader reports of involvement in local natural resource decision-making
	Effective monitoring	Household and leader reports of monitoring for rule breaking around forest use and access
	Graduated sanctions	Household and leader reports of differential sanctioning for varying levels of rule breakage
	Effective local conflict resolution	Household satisfaction and confidence in local conflict resolution
Collective Action	Trust	Perceived level of trust in daily activities among community members
	Intergroup relations	Levels of conflict within and across communities and subgroups within communities (such as different ethnic groups)
	Participation	Levels of participation in community decision-making
Agriculture and Land	Increased agricultural investment and productivity	Average cocoa crop yield
	Increased use of sustainable/ regenerative practices	Number of hectares of cocoa under improved management practices or technologies/cocoa agroforestry
	Increased shade tree uptake	Number of shade trees planted
	Increased shade tree survival rate	Number of shade trees surviving at endline and follow-on
Resilience	Increased household resilience	Average score on the ability to recover from shocks and stresses index

Outcome Type	Illustrative Outcomes	Potential Indicators
	Use of natural resources to reduce effects of shocks and stresses	Average score measuring the extent that households rely on natural resources during times of stress
Child Labor	Labor on-farm during school hours	Household reports of children's involvement in cocoa farm preparation/maintenance/harvesting
	Labor on-farm outside of school hours	Enumerator Observation of children at home/on farm during the period of data collection
Socio-economic well-being	Increased socio-economic status	Percent of households below the comparative threshold for the poorest quintile of the Asset-Based Comparative Wealth Index
		Change in per capita household consumption/expenditures in key areas such as health, education, etc.
	Women's empowerment	Percent of women achieving high empowerment on the survey-based women's empowerment index
	Increased benefits from alternative livelihood activities	Average household income from nature-based products and/or services

GHANA DATA COLLECTION

Baseline data collection will include the following key activities: (1) settlement listing to construct a sampling frame for quantitative data collection; (2) quantitative surveys including a household survey, spousal survey, village leader survey, and LMB survey; and (3) qualitative data collection including KIIs and FGDs.

Settlement Listing

The Settlement Listing exercise is to confirm the existence and location of comparison villages (and the village/settlements around these villages on the same road) and obtain basic village-level information of these villages/settlements through a simple SurveyCTO form capturing basic village information with GPS coordinate marker. This ground-truthing listing exercise is required to create an accurate and complete list of all villages in each area but will also support community entry and the development of a household sampling frame (see below).

Quantitative Data Collection

150 villages (comprised of RESTORE, P4F, and non-ofi sites) will be surveyed in Ghana as part of the evaluation. Each village will include 15 household (cocoa farmer) surveys, 5 spousal surveys, 1 village leaders survey, and 1 LMB representative survey for villages with an LMB. Data will be collected electronically by enumerators.

Survey respondents will be identified through the following approaches:

- **Household Surveys in villages covered by a LMB:** For ~100 villages with LMB (RESTORE and P4F), the ET will obtain a list of member cocoa farmers from the LMB during the listing exercise, which will serve as our sampling frame for the household survey. The team will prioritize surveying beneficiaries of RESTORE's alternative livelihood and tree registration component (if known at the time of baseline), and then randomly select other farmers on the list. When feasible and data is available, respondents will be stratified by female-headed households, under 35 year-old male-headed households, over 35 year-old male-headed household, to make up 15 households sampled per village.
- **Households Surveys in villages without an LMB:** In the ~50 villages (non-ofi villages) with no Landscape Manage Boards, the ET will randomly samples 15 cocoa farmers in each village, stratified by female-headed households, under 35 year-old male-headed households, over 35 year-old male-headed household. Sampling will be executed through a random walk approach.[30]
  Spousal Survey: Spouses of 5 male household heads that completed the household survey will be asked to complete the wives survey per village.
- **Village Leader Survey**: For the village leader survey, the ET will interview one opinion leader in each village. An opinion leader is a local leader recognized to represent the village's opinions and attitudes towards natural resource management, whether said person holds an official position or not.
- **LMB Representative Survey in villages covered by an LMB:** The ET will interview one LMB representative for the LMB representative survey. We expect that in many cases, the village opinion leader will be a member of the LMB, and we will seek to interview a different respondent.

Household/individual-level survey instruments will aim to collect data on agriculture and land, agroforestry and climate-smart agricultural practices adoption, conservation attitude and practice, food insecurity, nutrition and health, governance, collective action, resilience, and socio-economic well-being. Household and community survey information collected through the RESTORE social data collection will also provide an opportunity to collect data on the individual factors that heighten the risk for viral zoonotic emergence, including human population density, cropland area, forest conversion, frequency of human interactions with wild animals, as well as wild animal hunting.

Qualitative Data Collection

Qualitative data collection will consist of 25 FGDs, of 6-10 people each, in ~6 villages that represent a range of relations with natural resources and protected areas (2-5 FGDs per village). The FGDs will take approximately 90 minutes and will be conducted using a discussion guide. All FGDs will have a lead facilitator and a note-taker provided by the data collection firm. FGDs will be recorded and transcribed verbatim, and transcripts translated into English. FGDs will be conducted in an accessible but private location,

Finally, 20 KIIs will be conducted with leaders in Natural Resource Governance of Protected Area and Cocoa-farming areas in each landscape. KIIs will take approximately 60 minutes and will be conducted

[30] Random walks involve choosing a starting point within a community, and then proceeding along a path, selecting every
X number of households to survey. Precise methods will be context specific and determined based on proposals from the data collection firms.

using an interview guide. All KIIs will also have a lead facilitator and a note-taker. KIIs must be recorded and transcribed verbatim, and transcripts translated into English. See Table 11 for a summary of the social data collection plan for Ghana.

Table 11: Data Collection Activity Summary Ghana

Data Collection Activity	Sample Size	Sampling Method
Quantitative		
Settlement Listing	150 villages	Identified by the ET.
Household Survey- 60 minutes	2250 (15 per village)	For ~100 villages with Land Management Boards (LMBs): 15 cocoa farming households that will include 1) purposeful sampling of households in the LMB members lists that are also beneficiaries of the alternative livelihood and tree registration component of the RESTORE program (if applicable to the village at the time of data collection); 2) selected cocoa farming households on LMB members list after the purposefully sampled households, to add up to 15 households total per village, stratified by female-headed households, under 35 year-old male-headed households, over 35 year-old male-headed households. For ~50 villages without Land Management Boards: randomly select 15 cocoa farming households in the village, stratified when feasible by female-headed households, under 35 year-old male-headed households, over 35 year-old male-headed households.
Spousal Survey – 30 minutes	750 (5 per village)	Randomly selected among the male-headed households sampled for the household survey.
Community Leader Surveys- 60 minutes	150 (1 per village)	With the opinion leader in each village identified by field team
LMB Representative Survey- 30 minutes	~100 (1 per village with LMB)	With the Land Management Board representative in villages that have LMBs.
Qualitative		
FGDs- 90 minutes	25 (exact amount will be determined pre-data collection. Please budget for 25 in the proposal)	In ~6 villages representing a range of villages contexts (relationship to natural resource and forest), we will conduct 2-5 focus groups in each village for the following groups: male cocoa farmers (6 FGDs total), female cocoa farmers (6 total), community members involved with off-farm restoration, (~2 total), tree registration, (~4 total), alternative livelihoods (~4 total)
KIIs- 60 minutes	20 (Landscape-level stakeholders)	With the following group of key informants: · Farmers providing land for off-farm restoration · District vet · District health representative · RMSC (1-2) · Forestry Research Institute of Ghana (1) · Forestry Department (2-3) · CocoBod · Wildlife Department · LMB (high governance levels, ~3-5) · Donors (World Bank, EU) (~2) · REDD+ program/Community Resource Management Area

COTE D'IVOIRE DATA COLLECTION

As with Ghana, baseline data collection will include the following key activities: (1) settlement listing to construct a sampling frame for quantitative data collection; (2) quantitative surveys including a household survey, spousal survey, village leader survey, and village committee survey; and (3) qualitative data collection including KIIs and FGDs.

Settlement Listing

As with Ghana, the Settlement Listing exercise is to confirm the existence and location of comparison villages, obtain basic village-level information of these villages/settlements, and support community entry.

Quantitative Data Collection

100 villages (comprised of RESTORE, and non-RESTORE sites) will be surveyed in CDI as part of the evaluation. Each village will include 12 household (cocoa farmer) surveys,[31] 5 spousal surveys, 1 village leaders survey, and 1 Village Committee representative survey for villages with a committee.

Survey respondents will be identified through the following approaches:

- **Households Surveys:** The ET will acquire a list of cocoa farmers that ofi sources from in the treatment villages. In control villages, the ET will randomly sample 15 cocoa farmers in each village through a random walk approach. Village level targets will be set to ensure representation from female-headed households, under 35 year-old male-headed households, and over 35 year-old male-headed household
- **Spousal Survey**: Wives of 5 married male household heads that completed the household survey will be asked to complete the wives survey. In polygamous households, we will survey the first wife.
- **Village Leader Survey**: For the village leader survey, the ET will interview one opinion leader in each village. An opinion leader is a local leader recognized to represent the villages opinions and attitudes towards natural resource management, whether said person holds an official position or not.
- **Village Committee Representative Survey**: The ET will interview one[32] village committee representative in villages with a functioning Village Committee of Rural Land Management. We expect that in most cases, the village opinion leader will be a member of the village committee, and we will seek to interview a different respondent.

As with Ghana, household/individual-level survey instruments will aim to collect data on agriculture and land, agroforestry and climate-smart agricultural practices adoption, conservation attitude and practice, food insecurity, nutrition and health, governance, collective action, resilience, and socio-economic well-being. Household and community survey information collected through the RESTORE social data

[31] Given budget constraints the evaluation is reducing the number of household surveys in CDI to 12 as no IE is anticipated at the individual (household level) in CDI. 12 households per village will be adequate to capture village level effects but may limit some sub-group analyses.

[32] As noted, village committees in CDI are comprised of several different associations that specialize in different landscape management issues. The ET will work with the village committee president to identify the appropriate respondent.

collection will also provide an opportunity to collect data on the individual factors that heighten the risk for viral zoonotic emergence, including human population density, cropland area, forest conversion, frequency of human interactions with wild animals, as well as cultural practices and behaviors, such as wild animal hunting.

Qualitative Data Collection

Qualitative data collection will consist of 25 FGDs, of 6-10 people each, in ~6 villages that represent a range of relations with natural resources and protected areas (2-5 FGDs per village). The FGDs will take approximately 90 minutes and will be conducted using a discussion guide. All FGDs will have a lead facilitator and a note-taker provided by the data collection firm. FGDs will be recorded and transcribed verbatim, and transcripts translated into English. FGDs will be conducted in an accessible but private location,

Finally, 20 KIIs will be conducted with leaders in Natural Resource Governance of Protected Area and Cocoa-farming areas in each landscape. KIIs will take approximately 60 minutes and will be conducted using an interview guide. All KIIs will also have a lead facilitator and a note-taker. KIIs must be recorded and transcribed verbatim, and transcripts translated into English.

See Table 12 for a summary of the social data collection plan for CDI.

Table 12: Data Collection Activity Summary CDI

Data Collection Activity	Sample Size	Sampling Method
Quantitative		
Settlement Listing	100 villages	All villages
Household Survey- 60 minutes	1200 (12 per village)	Randomly select 15 cocoa farming households in the village, stratified by female-headed households, under 35 year-old male-headed households, over 35 year-old male-headed households.
Spousal Survey – 30 minutes	750 (5 per village)	Randomly selected among the married male-headed households sampled for the household survey.
Community Leader Surveys- 60 minutes	100 (1 per village)	With the opinion leader in each village identified by field team
Village Landscape Committee Representative Survey- 30 minutes	49 (1 per village with Village Committee)	With the Village Landscape Committee representative in villages that have village committee.
Qualitative		
FGDs- 90 minutes	20	In ~5 select villages, the field team will conduct 3-5 focus groups per village for the following groups: male cocoa farmers, female cocoa farmers, community members involved with village boundary tree planting/management
KIIs- 60 minutes	20 (Landscape-level stakeholders)	Purposively selected by the ET.

ECOLOGICAL OUTCOMES AND DATA COLLECTION

Table 13 below includes ecological data collection methods aimed at measuring core ecological outcomes in species presence and abundance, habitat and forest quality, and zoonotic risks. These outcomes have important implications for improving livelihoods from cocoa farming through more

sustainable and productive agricultural practices, reducing the cost burden due to malaria and other diseases, and increasing tree cover.

Currently, the ET does not anticipate significant ecological outcomes for off-farm interventions in CDI. For the most efficient use of resources, off-farm measurements in CDI are limited to Geographic Information System (GIS) Boundary Mapping to support the collection and analysis of satellite imagery, and secondary data on boundary tree planting from the IPs. Should there be significant tree survival rate, additional ecological outcomes may be collected and compared between treatment and comparison areas in subsequent rounds of data collection.

This section provides an overview of ecological data collection in both countries.

Table 13: Ecological Data Collection Methods Overview

Method	Illustrative Outcomes	Ghana Off-Farm	Ghana On-Farm	CDI Off-Farm	CDI On-Farm
GIS Boundary Mapping for Satellite Imagery	Forest Coverage Thermal Variation Carbon Removal	**YES**		**YES**	
Transect Walk	Species abundance, diversity, and richness Malaria prevalence and zoonotic risk Carbon Removal	**YES**	**YES**		**YES**
Acoustic Recorders		**YES**	**YES**		**YES**
Insect Traps		**YES**	**YES**		**YES**
Camera Traps		**YES**	**YES**		**YES**
Water Quality Testing	Chemical (pesticides) and microbiological pollution pH, temperature, conductivity, turbidity and alkalinity	**YES**			
Soil Quality Testing	Soil pH, Organic carbon content, Phosphorus	**YES**	**YES**		

GHANA DATA COLLECTION

Ecological data collection for both Ghana and CDI are divided between off-farm and on-farm interventions.

Off-farm Planting

RESTORE's off-farm planting (SA1) in Ghana consists of around 40 hectares of community land (5-6 discrete sections) identified by local villages for restoration. The study area will include these 40 hectares of land and an additional 40 hectares of comparison land (P4F sites) without RESTORE programming or any other off-farm planting programs.

Each off-farm site will undergo the following data collection activities. Data collection will be carried out by firms procured under the RESTORE evaluation and overseen by the ET Ecology Expert and Team Leader.

GIS boundary mapping. Sampled sights will be mapped using a GPS application to capture GPS coordinates while moving along boundary lines. Key geographical features which intersect with boundary points (streams and roads) will be noted. The goal of this exercise is to clearly define the sample frame. This data will be used to define area boundaries for subsequent data collection as well as mapped against existing satellite data.

Satellite Data: The evaluation plans to use Sentinel -2 satellite data and Dynamic World data to create Land Use Land Cover classes at 10m resolution[33] covering: water, trees, grass, flooded vegetation, crops, shrub and scrub, built structures, and bare ground coverage to measure habitat quality.

The evaluation will produce spatial statistics on the type and distribution of land cover classes for the study areas – patch sizes, contiguity, complexity, edges- to describe the ecology of the patches as an important component of habitat quality. The evaluation will also create remote sensing-based indices that measure vegetation, vegetation health and soil types, as feasible, such as the Normalized Difference Vegetation Index and soil indices for the areas of interest.

Transect walks. Transect walks will capture floral and fauna diversity. Sampled areas will be grided into 1 Hectare plots. Each plot will be subdivided into 25 subplots (20mx20m) and a central survey line will be marked in each subplot. Survey teams will walk the central line and record all flora with a diameter of more than 10 cm at breast height (1.3 meters above the ground). Fauna will be measured using direct observation during the transect walk (i.e., for dung, trails, footpaths), and through systematic refuge examination (e.g., under rocks, tree stumps and leaf litter). All observations will be systematically recorded, categorized, and counted to determine species abundance, diversity and richness in the various landscapes, with emphasis on species important to habitat and zoonosis disease transmission.

Acoustic recorders. Recorders (e.g., Wildlands Acoustics Song Meter Mini (for birds) and Sound Meter Mini 2 Bat (for bats)) will be deployed over several weeks. Recorders will be placed at a minimum of 100m from each other and 100 or 200m from a non-paved or paved road respectively (to avoid contamination). There will approximately one pair of recorders for the first 10 hectares of land, 2 recorders for 10 – 14.9 hectares, and 3 pairs for any location over 15 hectares. Recorders will be left in place for a minimum of three days and allow for the measurement of avian, bat, and insect diversity. Due to space and battery limitations, recorders may be set to record from 4am-11am and 4pm-11pm only. Bat recorders should activate automatically when high frequency sounds are detected and record continuously for 30 minutes after. If automatic activation is not feasible the recorders will record for 1 hour before sunset to 3 hours after sunset.

Extraneous noise (e.g., non-animal sounds like motorbikes, water running, etc.) will be removed from recordings and then sounds classified using an automated species identification software (to be proposed by the data collection firms). Automatic processing based on computer algorithms developed from a call library allows for the classification of large amounts of data. A subset of data will be manually reviewed alongside the auto classification to verify the accuracy by a field expert. This manual verification can

[33] Brown, C.F., Brumby, S.P., Guzder-Williams, B. et al. Dynamic World, Near real-time global 10 m land use land cover mapping. Sci Data 9, 251 (2022). doi:10.1038/s41597-022-01307-4

support the identification of poor audio quality or conflicting audio inputs that lead to the misclassification of species.

Insect traps. An entomological survey will also be conducted to sample insects with particular interest on ecologically and socially (health and agriculture) relevant insects, such as pests, pollinators and mosquitos, which are important in zoonosis disease transmission. At a minimum, two types of traps will be used for the following:

- Monitoring pollinators of cocoa (e.g., midges) will use UV-bright painted pan traps or similar technology. Collection times are best from 7AM-noon. Butterflies and other large pollinators can be counted via direct observation or with baited traps.
- Capturing non-pollinators (e.g., mosquitoes) will use Centers for Disease Control light traps -- at least half will be baited with CO_2.

Traps will be reviewed, and insects identified by morphological characteristics (form, color, etc.). Insects will be counted and classified by field staff.

Water Quality Testing. Certain water characteristics including pH, temperature, conductivity, turbidity, and alkalinity will be measured on site, at the point of origin using multi-meter probes. In addition, water samples will be taken from sampling points in selected sites and analyzed in a lab for the presence of heavy metals (e.g., lead, cadmium), pesticides, and microbiological pollution.

Soil quality testing. The soil profiles of each landscape (e.g., soil color) will be described on site following standardized guidelines. In addition, soil samples will be taken at selected sites and analyzed for nutrients, organic carbon, pH, CaCO3 and soil texture at local labs.

Camera traps. Following the transect walk, camera traps (e.g., Deer Cam DC300 film unit) we be placed at locations expected to maximize detection of species of interest. This includes near water and food sources or locations where animal tracks are noted with ideally one camera trap for every 10 hectares. Cameras will be operated continuously until retrieved (typically after 3–4 weeks). Data will be processed with an auto identification software including manual spot-checking for accuracy.

On-farm

The on-farm ecological data collection will collect data on 5 cocoa farms in each of the program and comparison villages (500 farms total). The ET will randomly select 5 people from the cocoa households surveyed and collect data on one farm plot from each of the 5 households.

The outcomes of interest of the on-farm area are similar to that of off farm including (1)Transect walks, (2) Acoustic recordings, (3) Insect traps, (4) Soil quality testing, and (5) Camera traps. On-farm measurements will include a few minor distinctions as noted here:

Transect Walks. Farm plots will be divided into hectares and one hectare randomly sampled and subdivided into subplots following the procedure for off-farm transect walks above for a total of 500 hectares transversed.

Soil Quality Testing. Purposive soil sampling method will be used in a smaller area than off-farm data collection. Soil samples will be collected (0-10cm depth) from several points within the farm plot and mixed thoroughly to form a composite before analysis.
Camera Traps. A subsample of farms will be purposively selected based on data from the transect walk to include a camera trap. Not all farm plots will include camera traps.

COTE D'IVOIRE DATA COLLECTION

Off-farm

As noted above, data collection activities to assess off-farm ecological outcomes in CDI are limited to GIS boundary mapping and satellite imagery during the baseline assessment. In addition, baseline will utilize secondary data provided by the IP on tree plantings to track tree survival rates over time. The re-introduction of native species and high tree survival rates may increase the opportunity for ecological outcomes, including increases in native pollinators and greater biodiversity to be measured in subsequent rounds of data collection.

On-farm

Similar to Ghana, the on-farm ecological data collection will collect data on 5 cocoa farms in each of the 100 villages (500 farms total). In each farm plot, the data collection firm will conduct the following data collection activities. To the extent feasible, methods will be aligned with the approach from Ghana in order to increase the comparability between countries. Methods in CDI on-farm data collection will include:

- **Transect walks** for forest quality and animal biodiversity as in Ghana. However, due to budget limitations, measurement of animal biodiversity will be excluded from transect walks. Instead, animal biodiversity will be captured through the methods below.
- **Acoustic recorders** for biodiversity measurement.
- **Insect traps** for ecologically and socially (health and agriculture) relevant insects, such as mosquitos and pollinators.
- **Camera traps** of ecologically important species and species of interest to zoonotic disease transmission.

Water and soil measurements are not currently planned in CDI.

Analysis Plan

Baseline Analysis Plan

At baseline, the ET will conduct analysis for three main purposes: (1) to assess the validity of the evaluation designs (i.e., update power calculations and conduct balance tests), (2) to conduct matching

between the treatment and comparison groups, and (3) to explore baseline characteristics (i.e., investigate relationships between key outcomes of interest).

1) **Assess validity of the evaluation design:** Power calculations presented in this report are based on illustrative ranges for ICCs and standard deviations. We will use the baseline data to calculate these parameters for our study sample. Power calculations will therefore be updated in the baseline report, using the final sample sizes and using the baseline data. In addition, the ET will check whether the various treatment and comparison groups are balanced along key observable characteristics. This will be done by conducting basic statistical tests of differences in means between treatment and control areas.
2) **Conduct matching between treatment and comparison groups:** See more details in Matching to Mitigate Balance Problems Section below.
3) **Explore baseline characteristics/relationships:** In addition to presenting descriptive statistics, the ET will explore the relationship between key outcomes of interest, such as by conducting regression analysis.[34] Although these results are not interpreted as causal, they may identify particular groups with high or low levels of on outcome variables that could be useful for program targeting, as well as identify areas for further qualitative research to better understand relationships between predictor variables and outcomes of interest.

Quantitative Analysis Plan

The quantitative data will be analyzed using two main approaches. First, indicators for the impact analysis will be analyzed through multivariate regressions using a DID approach with a panel dataset, including sub-group analyses and matching. Second, for any before-after comparisons of performance outcomes or relevant contextual analysis that is supported by quantitative data, we will present descriptive statistics (where applicable). As a DID required measurements over time, DID analysis will not be included in the baseline report. Rather, the purpose of the baseline as noted above will confirm the DID approach and explore baseline characteristics/relationships.

[34] For example, this analysis can explore baseline relationships between governance and forest condition, and/or factors that explain farmers' proclivity to plant shade trees.

DID Panel Analysis

The ET proposes a DID approach to determine the effect of the RESTORE project on the impact and rigorous performance indicators of interest (e.g. forest condition and biodiversity, tenure, governance, tree planting and sustainability, and livelihood indicators).

The ET proposes a panel analysis (i.e., surveying the same participants, utilizing the same plots, at each point in time) which allows for more precise measurement of change.[35] Combining baseline and endline data collected for the treatment and matched comparison groups, the DID model can be estimated by using the following multivariate regression approach:

$$Outcome = \alpha + \beta T + \gamma F + \delta(T \cdot F) + \lambda X + \varepsilon \quad (1)$$

The left-hand side of the equation is the outcome variable of interest (see list in Descriptive Statistics Section). The variables on the right-hand side include:

- A dummy variable T that is equal to 1 if the observation is in the treatment group and zero if otherwise. The estimate of β captures the group effect. In other words, T controls for any differences in the outcome variable that are associated with being in the treatment group.
- A dummy variable F that is equal to 1 in the follow-up year and zero in the baseline year. The estimate of γ captures the time effect. In other words, F controls for any changes in the outcome variable that occur over time and are common for treatment and comparison group members.
- An interaction term $(T \cdot F)$ that is equal to 1 if the observation is in the treatment group and in the follow-up year, and zero otherwise (i.e., for comparison group members/locations in both the baseline and follow-up years, and for the treatment group in the baseline year). The estimate of δ captures the impact of the project on the outcome variable—this is the parameter of interest.
- A vector X of other relevant explanatory variables that may be related to the outcome of interest and will help control for baseline household/land characteristics. Including these explanatory variables will reduce the amount of unexplained variation in the outcome variable, thereby increasing the accuracy of our parameter estimates. The estimate of λ captures how much variation in the outcome variable is explained by these other factors.
    - At a minimum, for household models, X will include the education, gender, and age of the household head.

[35] The ET considered cross-sectional and panel approaches; A cross-sectional approach involves surveying different activity participants at each point in time, whereas a panel approach involves surveying the same participants at each point in time. Panel approaches have the benefit of being able to measure whether outcomes for a *specific household or location* have changed over time, while cross-sectional surveys reflect general changes for the *sample population or area* over time. In general, panel surveys allow for more precise measurement of change, but they are more challenging and costly to implement, as there are additional costs to track the same households over time. The ET believes that tracking costs will be mitigated as there is no evidence of significant out-migration from target communities.

- X will also include dummies for any additional RESTORE activities that communities are exposed to in addition to the primary intervention of interest (e.g., if we are estimating the impacts of off-farm activities, dummies may be included indicating whether the community also received livelihood interventions, etc.).
- Other explanatory variables will include covariates that are not balanced at baseline, to control for baseline variation between treatment and control groups, as well as any variables that are highly correlated with the key outcomes of interest, to explain variance in outcomes.
- Village fixed effects or household fixed effects will be included as relevant given the level of analysis.

- The error term is represented by ε and is assumed to be normally distributed with mean zero.

For each regression model, we will estimate the parameters α, β, γ, δ, and the elements of the vector λ. All things being equal, the positive parameter estimates will indicate that the corresponding right-hand side variable is associated with an increase in the outcome measure. Likewise, negative parameter estimates will indicate a negative association. We will use t-tests (F-tests for joint hypotheses) to detect the statistical significance of the parameter estimates. Robust standard errors will be clustered at the settlement level for the household level analysis, to account for serial correlation in responses across households within the same geographic area, using Huber-White sandwiched standard errors.

Gender and Other Subgroup Analysis

Understanding whether and how program impacts vary across a set of population and relevant context factors contributes to more effective programming decisions for future implementation. Based on the program theory and literature, we expect to find variation in the treatment effect across a number of subgroups. Where sample size permits, outcomes will be tested for heterogeneous treatment effects across a number of household subgroups. This includes the following[36]:

- Gender of household head
- Household baseline wealth status (asset-based wealth index; lowest quartile vs. others);
- Age of household head at baseline (continuous, and under 35 vs. others); and
- Tenure status.

To test for heterogeneous treatment effects across these subgroups, we will modify the basic regression model for household level analysis above to include terms that capture potential subgroup effects. More specifically, for the subgroup analyses of the DID model, our regression models will be as follows:

$$Outcome = \alpha + \beta T + \gamma F + \xi S + \delta_1(T \cdot F) + \delta_2(T \cdot S) + \delta_3(F \cdot S) + \delta_4(T \cdot F \cdot S) + \lambda X + \varepsilon \qquad (2)$$

As before, the left-hand side variable is the outcome of interest. Many of the right-hand side variables are the same as in the basic regression model. Explanatory variables added for the subgroup models include:

[36] To the extent our baseline sample captures sufficient variation in tenure status among respondents, as well as those of migrant versus local status, we will examine heterogeneous effects for those subgroups too.

- A dummy variable S that is equal to 1 if the observation is in the subgroup and zero if it is otherwise. The estimate of ξ accounts for differences in outcomes associated with being in the subgroup of interest.
- An interaction term $(T \cdot S)$ that is equal to 1 if the observation is in the treatment group and the subgroup of interest, and zero if otherwise. The estimate of δ_2 captures the incremental treatment group effect for observations in the subgroup.
- An interaction term $(F \cdot S)$ that is equal to 1 if the observation is in the follow-up period *and* the subgroup of interest, and zero if otherwise. The estimate of δ_3 captures the incremental time effect for observations in the subgroup.
- An interaction term $(T \cdot F \cdot S)$ that is equal to 1 if the observation is in the treatment group, in the follow-up period and in the subgroup of interest. The estimate of δ_4 captures the potential differential effect of the project for the subgroup—this is the parameter of interest.

For the subgroup models, we will estimate not only the parameters α, β, γ, and the elements of the vector λ, but also the parameters ξ, δ_1, δ_2, δ_3, and δ_4. In these models, the expected outcome for individuals in the subgroup is equal to the expected outcome for non-subgroup individuals plus: 1) a subgroup effect (ξ), 2) an incremental treatment group effect (δ_2), 3) an incremental time effect (δ_3), and 4) the incremental effect of the projects (δ_4). Thus, our estimate of δ_4 will indicate whether the impact of the project is different for the subgroup of interest. If δ_4 is positive, then the program has a greater impact on the outcome for the subgroup, all else being equal. Likewise, if δ_4 is negative, then the program has a smaller effect on the outcome for the subgroup. We will use t-tests (F-tests for joint hypotheses) to evaluate whether our estimate of δ_4 is statistically significant. If so, then we can be confident that the impact of the program is indeed different for the subgroup of interest. Robust standard errors will be clustered as appropriate based on the level of analysis.

Matching to mitigate balance problems

Matching techniques essentially aim to mimic a randomized experiment by ensuring that the treatment and control groups have similar distributions of observed characteristics. The aim of preprocessing with matching and reweighting is to improve the covariate balance between treatment and control groups. However, unlike randomized experiments, matching relies on the assumption of selection on observables—i.e., that all of the relevant variables used to assign treatment are included in the matching.

We propose comparing different techniques for matching and reweighting observations to improve balance. First, we will use propensity score matching, with weighting based on the Mahalanobis distance metric. Propensity score matching pairs treatment to control observations based on the estimated probability of assignment to treatment. Logistic regression is used to estimate the propensity score, which is used to match treated and control households. Unmatched observations are then discarded from the analysis. Finally, the observations are reweighted using the Mahalanobis distance metric. Combining the Mahalanobis metric with propensity score matching has been found to have preferable qualities to using propensity score matching alone.[37]

[37] Liski, E. P. (2010). Design of observational studies by Paul R. Rosenbaum. International Statistical Review, 78(3), 477–478. https://doi.org/10.1111/j.1751-5823.2010.00122_30.x.

Second, we will use propensity score matching, with reweighting via a genetic algorithm. This technique also matches based on the propensity score, but it uses an evolutionary search algorithm rather than the Mahalanobis distance metric to find weights for each covariate that optimizes covariate balance. Genetic matching often finds better balance than propensity score matching, and the estimations are typically less biased than those obtained via propensity score matching alone.[38]

Third, we will employ entropy balancing, a technique for preprocessing data which reweights observations without matching.[39] As with matching, the user specifies a set of covariates which form the basis for a reweighting scheme. An entropy balancing algorithm then finds weights for observations in the control group, and no matching or discarding of observations occurs. Entropy balancing reweights household observations in the control group to achieve balance across treatment and control groups on outcome indicators of interest. Following best practices, the matching procedure which yielded the best reduction in bias across the most important covariates – taking reductions of sample size into account – will be selected for subsequent use in the matching approach.[40]

Descriptive Statistics

For any before-after performance outcomes or relevant contextual analysis that is supported by quantitative data, we will present descriptive statistics (where applicable). This may include descriptive statistics for output indicators and/or intermediate outcomes measured through IP monitoring data, such as sapling planting, enterprise financing, etc.

Qualitative Analysis Plan

All FGDs and KIIs will have a lead facilitator and a note-taker. FGDs and KIIs will be audio recorded on digital voice recorders, transcribed, and then translated (if not conducted in English). Qualitative data transcription will be undertaken by the same researchers who conducted the discussion or interview, as soon as possible after the discussion or interview takes place. This practice ensures the full and seamless integration of additional context information and inaudible information (body language, etc.) into the transcript. The qualitative researchers leading the FGD or KII will transcribe the audio recording into Bemba (or whatever other language the FGD/KII was conducted in) and translate to English (if that was not the language the FGD/KII was conducted in). Each transcript will include a table to record key information to facilitate analysis and matching (e.g., geographic information, gender, etc.).

Analysis will involve reading and re-reading the transcripts and carefully coding and analyzing data according to queries that are designed to correspond directly to the evaluation questions for this evaluation, as well as subgroup analyses. The team will first develop a codebook of approximately 30 codes, following best practice to allow for granular analysis without over-crowding the number of codes.

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[38] Diamond, A., & Sekhon, J. S. (2013). Genetic matching for estimating causal effects: A general multivariate matching method for achieving balance in observational studies. Review of Economics and Statistics, 95(3), 932–945. https://doi.org/10.1162/rest_a_00318.

[39] Hainmueller, J. (2011). Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis*, 20, 25-46. doi:10.1093/pan/mpr025

[40] Austin, P. (2009). Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. *Statistics in Medicine*, 28, 3083-3107. doi:10.1002/sim.3697

Then, at least two ET members will be trained to code the qualitative data. This will first involve a comprehensive training on the codebook itself, to ensure understanding of key terms and differentiation between codes. Then, each team member assigned as a "coder" will code the same 2 transcripts in their entirety, along with one of the senior members of the team. The team members will then reconvene to assess inter-coder reliability, resolve any questions, and if needed, refine and finalize the codebook.

Thematic coding will occur in an Excel matrix with a pre-defined codebook. Transcripts are coded to support the identification of patterns, overlapping themes, as well as extracting quotes to supplement the quantitative findings. Quotations will be selected from the transcripts to illustrate the findings with simple, focused pieces of information representing key themes. The ET will integrate results with quantitative findings to maximize the value-add of the qualitative data collection for this evaluation.

Limitations, Risks, and Mitigation

This section summarizes key challenges to conducting a rigorous evaluation of the RESTORE Activity including selection bias of communities, changes to implementation plans (i.e., implementing activities in control areas, or not implementing activities in treatment areas), and potential contamination from other organizations doing similar conservation, agriculture, and/or health interventions in the RESTORE Activity area. These challenges are not unique to the RESTORE activity, but rather are common for IEs of conservation and development programs.

Selection Bias. Selection bias can be introduced where the treatment and comparison groups are systematically different from one another. In both Ghana and CDI, the main challenge with identifying comparison groups is the saturation of cocoa-agroforestry programs. While the team was able to identity an area on the west side of the Sui River Forest reserve in Ghana to be a comparison group (for SA1), it is likely that these villages are systematically different from the villages that do receive ofi or other agroforestry programming. One known difference is that these villages do not have LMBs. Another is that they are not as close to the forest and therefore the opportunity for restoration is reduced. Similarly, in CDI the team will utilize areas where village boundary setting is delayed as a comparison, but the prioritization of some villages over others may indicate underlying differences in treatment and comparison locations. The quasi-experimental design combining statistical matching with DID estimates significantly reduces, but does not eliminate, the risk of selection bias due to sampling.

Integrated Interventions. Co-location of activities presents both an opportunity and a challenge for the evaluation design. In areas where the RESTORE activity implements a "bundle" or "package" of interventions, the evaluation cannot disentangle the causal effect of any one intervention or type of sub-activity on outcomes of interest. The evaluation will only be able to ascertain the average treatment effect for the project, potentially with some descriptive analysis comparing areas or communities that receive different bundles of interventions. Even when interventions are "unbundled" (e.g., livelihood packages), the sample size may be too small to measure unique outcomes related to that intervention. However, if there is a significant sample size with varying combinations of integration/bundles that could be compared against one another, this would present an opportunity to isolate the effects of the

different interventions. However, it should also be emphasized that without significant overlap of interventions, the evaluation will not be able to measure the impact of an 'integrated' program, and instead will be measuring the impact of discrete interventions only ,revealing a tension between the desire to know the effects of individual programmatic components, and integrated programming.

The breadth of programming approaches in RESTORE requires the evaluation to measure a large and diverse range of outcomes to capture USAID + HEARTH learning objectives. In doing so, the ET is limited in the depth to which each individual outcome can be examined. For both budgetary and logistical reasons (e.g., avoiding time-consuming surveys and respondent fatigue) instruments will be limited to the core outcomes anticipated to be affected by RESTORE programming.

Programmatic Assumptions. RESTORE is not doing large-scale off-farm native tree planting in Cote D'Ivoire. Even in Ghana where there will be intensive reforestation efforts, RESTORE is working in an area that is significantly degraded requiring time for biodiversity changes to take place. In CDI, off-farm intervention efforts in boundary planting are not anticipated to have substantial ecological or biodiversity impacts. For these reasons, the context to study zoonosis spillover risk is limited though the study will track indicators related to human/wildlife contact and human health outcomes.

Spillover. The evaluation design takes several forms of spillover into account. Spillovers are indirect effects of a program on those who have not been direct participants. For example, cocoa farmers might adopt new technologies/approaches that they see benefiting other farmers (behavioral) or households might learn about benefits of conservation from their neighbors (informational). If spillovers are not considered in the evaluation design, they can become a threat and contribute to either over or under estimating program impacts. To mitigate this risk, the evaluation design (1) uses the settlement or community as the unit of treatment when appropriate to allow for between-household spillovers within the same community and (2) will establish to the extent feasible a minimum distance between treatment and control settlements during sampling to reduce any risk of between-community spillover. Through the survey instruments and M&E data collection, the evaluation will capture measures to help determine the extent of spillover for those that do not directly participate in the program activities. Finally, if appropriate, the evaluation will analyze whether program impacts are robust to the exclusion of communities/households where we believe spillover has occurred.

Non-compliance or partial compliance This occurs when there is a deviation from implementation plans (i.e., people in control areas receive activities, or people in treatment areas do not receive activities). This can happen for a variety of reasons; for example, perhaps a farmer who signs up for regenerative agriculture training never actually attends, or instead of using farming inputs, decides to sell it instead (both examples of treatment not getting treated). Or perhaps IPs do not adhere to implementation plans and implement activities in control areas (an example of controls getting treated). To minimize the potential threats from non-compliance, the ET will need to ensure strong buy-in from all IPs, as well as ensure there are robust tracking systems in place regarding who is receiving what activities throughout the program. The evaluation design for the agricultural intervention specifically considers the expected non-compliance rate, but it cannot eliminate this risk.

Even with full compliance from participating IPs there is a risk of comparison areas receiving interventions from other sector stakeholders that are similar to those provided by RESTORE

programming. The presence of comparable interventions in comparison areas will diminish the observable affect of RESTORE programming. Similar to tracking within program compliance and spillovers, the ET will utilize survey instruments and interviews to capture the presence and intensity of non-RESTORE programming in comparison areas in integrate these findings into analysis.

Attrition. As the ET is proposing a panel approach, whereby we will attempt to survey the same participants at several points in time, attrition is a risk to the evaluation (i.e., household or farmers migrating, which makes it difficult or impossible to locate respondents for follow up surveys) for several reasons. First, it may limit the external validity of the findings if those who remain in the study are characteristically different from those who drop out. Second, attrition reduces the sample size and thus the study's statistical power. This has been mitigated to the extent possible by accounting for attrition in the power analysis. Finally, and perhaps most concerning, is the risk of differential attrition between treatment and comparison arms of the study.

Response Bias. Response bias encompasses a range of tendencies among interview respondents to answer in a way that is untruthful or inaccurate. For this evaluation, the risk of response bias comes primarily from social desirability bias (tendency to answer in a way that will be seen as favorable instead of answering truthfully) and asking about topics that are illegal, including land clearing/encroachment in conservation zones, etc. which can lead to under-reporting.

While it is difficult to eliminate this risk completely in survey-based research, the ET will work to minimize social desirability bias through question framing, shortened recall periods, and preambles to sensitive questions reminding respondents of both the strict confidentiality of their responses and the importance of accuracy in research. Additionally, the ET will develop survey experiments to generate more accurate estimates of behavior through anonymization techniques, considering approaches such as randomized response and unmatched count/lists. In these approaches, the response of the individual is masked/hidden, but the prevalence of the behavior in the population can be estimated. There is a growing literature on these approaches, including on when they are most useful, which the ET will utilize.[41]

Data Collection Timing. Finally, as discussed in previous sections, it is important for baseline data collection to occur before the rainy season begins and makes certain study areas inaccessible. Based on the current timeline, this is feasible, although logistically and administratively challenging. The field data collection plan will utilize large teams of enumerators to ensure the completion of the household and farmer survey before the end of May 2024.

[41] Ibbett, H., Jones, J. P. G., and St John, F. A. V. (2021). Asking sensitive questions in conservation using randomised response techniques. Biological Conservation, 260, 109191. https://doi.org/10.1016/j.biocon.2021.109191

Data Collection and Management

Data Collection Preparations

While a local data collection firm will be competitively procured to conduct primary baseline data collection, the ET will closely manage the data collection process on the ground, including logistics, enumerator training, survey programming, data security and back up, and data quality assurance (DQA).

Instrument and Field Manual Development. Quantitative surveys will be developed by the ET, drawing heavily on best practices and standard modules from the HEARTH M&E Toolkit, and adapted as necessary for the local context.[42] All quantitative surveys will be programmed in an electronic form using SurveyCTO, an Open Data Kit-based platform, which allows for electronic data capture across multiple platforms (tablet, phone, and web) as well as real-time data submission and monitoring. Qualitative guides will be developed custom based on the evaluation questions. All surveys and guides will be developed with inputs from the RESTORE IPs and the local data collection firm. All data collection tools will be translated from English into Akan, French, Kwa and other languages as necessary. For both quantitative and ecological data collection, data collection firms will develop field manuals in consultation with the ET. Field manuals will include best practices and clear instructions as to sampling and data collection approaches.

Pre-test. Prior to the launch of data collection, all tools will be pre-tested using small teams of enumerators with a sample of respondents that are similar to the population of interest, but outside of the sampling frame. The purpose of the pre-test is to verify the appropriateness and comprehensibility of the tools and gauge the overall time required for a survey. The pre-test will be used to identify and fix any important and unforeseen issues with the instruments, particularly around reliability, protocol, language, concept definition, and question sensitivity. The electronic survey program will also be bug-tested in-house.

Enumerator Training. Following the pre-test but prior to the launch of data collection, an enumerator training will be conducted to sensitize enumerators to the purpose of the evaluation, provide an in-depth review of the tools and sampling methods, and outline expectations, roles, and responsibilities for the overall data collection exercise. Enumerator trainings will include more enumerators than required so that the top performers—in terms of participation, attendance, scores on an end-of-training assessment, and role plays—can be selected for the full exercise.

Pilot. In addition, the training will include a pilot exercise whereby enumerators will practice administering the tools on a sample similar to the population of interest. The pilot will cement the

[42] USAID, "HEARTH Monitoring and Evaluation Toolkit," (2022): https://pdf.usaid.gov/pdf_docs/PA00ZBDF.pdf.

enumerators' knowledge of the instrument and test the field logistics in a practical setting. Full trainings will be held prior to each round of data collection.

Data Quality and Monitoring

Field Supervision. For primary data collection, teams of enumerators will be assigned to specific geographic areas and each team will have a supervisor who is onsite for the duration of data collection activities. This will be the case for both social and ecological data collection. The supervisor is expected to oversee field work logistics as well as ensure adherence to data collection protocols. It is also expected that supervisors will observe a subset of all interviews (or data collection activities in the case of ecological data collection) and complete an electronic accompaniment form (to be programmed by the ET) to assess the enumerator's performance.

In addition to field supervision and other monitoring activities conducted by the data collection firm, members of the ET may choose to conduct monitoring visits and/or spot checks. ET members will be present during all stages of piloting and pre-testing and will also participate in debriefs with field teams (i.e., after data collection is completed for the day) during the early stages of data collection.

Daily debriefs. Supervisors will plan to debrief with their teams at the end of each day of data collection. Debriefs provide an opportunity for enumerators to share and seek guidance on any problems that arose during the day, such as in administering certain survey questions, dealing with problematic respondents or situations, etc. Debriefs also allow supervisors to make general observations on areas for improvement resulting from the day's accompaniments. The ET will provide supervisors with a list of discussion topics and supervisors will proactively facilitate daily discussions and probe as much as possible to surface problems so that they can be remedied early. The ET will communicate to supervisors the types of issues (such as data loss or sharing of personal data by an enumerator) that need to be immediately communicated up, as well as those which can be documented and resolved at the field level. Supervisors will take detailed notes at each daily debrief—including problems, resolutions, and next steps—and collate these into a weekly report which will be submitted to the ET for review.

Back Checks. Back checks for social data will involve re-visiting a subset of households three to seven days after the original data collection effort to verify a subset of survey questions. These questions will focus on critical outcome indicators and difficult survey modules. Back checks will be conducted using a separate enumerator not participating in the face-to-face surveys. Incoming back check data will be checked against original survey data daily during the first week of data collection and weekly thereafter so that any issues related to data falsification, inadequate training, and measurement error can be immediately remedied.

High Frequency Data Checks. High frequency checks (HFCs) will be conducted via customized Stata .do file(s) that are run on incoming, raw data at regular intervals throughout the course of data collection. The purpose of the HFC is to proactively identify and remedy issues related to survey programming, question clarity, and enumerator error/performance. Specific checks covered include date and time consistency, survey completion, duplicates, distribution of responses, rates of "don't know"

and "refused to answer", and comments provided by the enumerator. HFCs will also include outlier checks, to identify, verify and correct (where necessary) potential outliers in near real-time. As with accompaniment and back check data, HFCs will be run daily during the first week of data collection and weekly thereafter throughout the duration of field work.

IRB Requirements and Local Clearance

The evaluation will be conducted in line with human subjects' research guidelines both in the United States, Ghana, and CDI. The ET will ensure appropriate ethical clearance of evaluation materials by an Institutional Review Board (IRB) to guarantee the protection of the respondents, particularly for vulnerable populations. IRBs have established protocols for gathering informed consent, protecting confidentiality, and personally identifying information, and ensuring ethical data collection. Social Impact (SI) has an in-house IRB registered with the U.S. Department of Health & Human Service Office for Human Research Protections. SI's IRB will review the study protocol, data collection procedures, consent scripts, and data collection tools. IRB review not only ensures that ethical procedures are followed but also that consent language and study procedures are in line with relevant contract requirements. In addition, the ET will adhere to human subject research regulations in Ghana and CDI, including local IRB review/clearance from the Council for Scientific and Industrial Research IRB, the National Committee for Ethics and Research, as well as facilitate any other local permissions required. The ET's local data collection partner will have additional certifications in human subjects' research and data security.

As part of the informed consent procedures, the IRB will require that all parties given access to identifying information (such as names, telephone numbers, addresses, and any combination of information that could uniquely identify an individual) be disclosed to respondents. To minimize risks of response bias, it is therefore strongly recommended that no persons outside of the ET be allowed to access raw data containing identifying information. It is especially important that respondents clearly understand that their responses are in no way linked to eligibility for current and future programs/services.

Data Management and Respondent Protections

The ET will protect respondents and ensure data is secure during data collection, transfer, storage, analysis, and dissemination.

Data Collection. Respondent and data protection in data collection starts first and foremost with the field data collection teams. It is critical that field teams understand proper procedures and behavior with respect to respondent privacy and data protection. Thus, during enumerator training, field teams will receive a detailed briefing from the ET on ethical data collection practices, and strategies for ensuring respondent comfort, privacy, and prevention of data breaches. This also covers interviewer behaviors while administering the survey, handling of any evaluation documents/devices, and key preventive measures including device encryption and password-protection. Further, all field staff will sign a non-disclosure agreement which covers a range of behavioral and procedural measures to which they will be held accountable. Secondly, and critically, data protection during data collection is further ensured

through the data collection software. Using SurveyCTO, the ET will control access to forms and datasets through a secure, password-protected, and permission-structured data server. It also allows for encryption during data submission from the field and storage in the server. Data will be encrypted, and only authorized study personnel will have access to the password in order to access and decrypt the data. In the rare care of any accidental breach during data collection (such as a loss of a backpack, theft of a device, etc.) field teams are instructed to report immediately to the ET, who then reports to the IRB to discuss the extent of the incident and identify mitigating actions to implement.

Data Transfer. Datasets or sub-sets of the data may need to be transferred directly between (a) ET personnel; or (b) between data collection firm management staff and the ET (i.e., as is often done to reconcile any issues flagged in high-frequency data checks). Dataset transfers in these cases will be done via a secure, shared folder. If any files need to be shared via email, this will be done securely using 7zip software, which allows for Advanced Encryption Standard-256-bit encryption in line with United States Government guidelines. Further, any datasets transferred in this manner will include personally identifiable information (PII) only when necessary for a purpose related to the evaluation. Otherwise, it will be removed to reduce any residual probability of accidental disclosure.

Data Storage & Analysis. After data has been collected, when it is being stored and/or used for analysis, data will be housed in secure locations. Stata datasets will be stored in a shared drive with restricted permissions, where only authorized personnel are able to access it, for the purposes of cleaning, managing, and analyzing the data. Once datasets have been cleaned and analyzed, data is backed up in password-protected and permission-restricted folders. This is the most secure way of storing the data after it has been analyzed as it is fully encrypted at rest and employs disk-level encryption and per-file encryption, conforming to Advanced Encryption Standard-256-bit standards.

Data Dissemination. All primary quantitative data collected as part of the evaluation will be submitted to USAID's Development Data Library. This will include public use data files for each quantitative survey; all codebooks corresponding to each datasets submitted; and analysis programs and command files for analysis and variable construction. The ET will also follow any additional HEARTH data management guidance/protocols as requested. Prior to dissemination, all data will undergo an internal de-identification review by the IRB. SI's IRB uses innovative templates to review datasets for potential accidental disclosures, queries the project teams about possible disclosure risks, and independently assesses the alignment between the team's data dissemination plans and consent language.

With regard to qualitative data, the ET will work with USAID to discuss on an instrument-by-instrument basis whether certain aspects of the qualitative data should be de-identified and disseminated either publicly or under restricted-access. The main considerations are whether (a) the data is analytically valuable more broadly to potential secondary users; and (b) whether the data can be provided such that no content potentially discloses information about any respondents that could potentially harm them. For example, FGD transcripts with a sample of beneficiaries meant to represent a larger population are typically more analytically useful and normally carry fewer risks than KII transcripts of higher-level officials speaking about specific aspects of a given program. In the latter case, the content of the discussion itself could disclose identity, and is often not generally valuable to other researchers. Based on consultation with USAID before data collection, informed consent scripts for qualitative data collection will reflect the eventual intention of data dissemination.

Written reporting will never contain PII or other information which could serve to disclose private or sensitive information.

Reporting and Dissemination

After data has been cleaned and analyzed, the ET will prepare the report with baseline findings. The baseline report will include all relevant USAID criteria for high quality IEs.[43] After the baseline report is finalized, the ET will disseminate findings virtually with the Mission, IPs, private sector partners, and other key stakeholders.

The ET will work together with USAID to disseminate key findings and lessons learned from the baseline across relevant USAID platforms (e.g., BiodiversityLinks, LandLinks, Mission social media platforms, etc.). This will include at least one blogpost providing an overview of the activity and key findings, a summary brief, and a live webinar/learning event for USAID and select IPs. To help foster knowledge sharing and collaboration across the Agency, all communications products will be posted on appropriate USAID knowledge portals for easy access and future reference. Other HEARTH activities will be a primary target audience for sharing findings and lessons learned. To facilitate use of the baseline findings, summary materials will be translated into local languages and key findings and lessons learned will be shared with IPs to maximize their utilization.

The ET will further encourage use of evidence generated by the evaluation in adaptive management for the RESTORE activity, including through participation in annual Pause and Reflects with the IPs and the Mission and assisting USAID and partners in interpreting findings, to help improve program effectiveness. Upon completion of the evaluation, the ET will work together with USAID in their development of the post-evaluation action plan.[44]

Roles and Responsibilities

The ET brings valuable experience and expertise in research and evaluation and development and conservation in Ghana and CDI. In addition to the team members below in Table 14, the ET will also subcontract data collection through a competitive procurement process to locally based partners with experience in survey management, quality control, and data collection and management, including in communities in the RESTORE project area. Finally, the University of Pennsylvania (UPenn) will be subcontracted to provide technical expertise and a team of students for data processing and analysis support.

[43] Criteria are based on a review Assessing the Quality of IEs at USAID (2020): https://pdf.usaid.gov/pdf_docs/PA00X78R.pdf.

[44]

Table 14: Team Member Positions and Roles/Responsibilities

Position	Name (Organization)	Role/Responsibilities
Team Leader	Heather Huntington (UPenn)	Provide leadership of the evaluation, including all technical and quality aspects.
Technical Advisors and Experts	William Pan, Peter Harrell	Provide overall technical support and expertise on forest ecology, biodiversity, and environmental health. Support the development of evaluation methodologies and data collection instruments, including processing and analysis of satellite imagery.
Evaluation Director	Mike Duthie (SI), Carly Mphasa (SI)	Provide quality assurance and technical oversight throughout all stages of the research/evaluation.
Evaluation Manager / Technical Specialist	Kimberlee Chang (SI)	Manage the evaluation on a day-to-day basis, as well as support the team in conducting research, managing data collection, and data analysis.
Evaluation Assistant	Julia Chen Heigel (SI)	Assists with administrative and logistical support, and technical tasks as required.
In-Country Coordinator(s)	TBD	Responsible for liaising with key stakeholders in Ghana and CDI, providing quality assurance/independent oversight, training support, as well as assisting any foreign-based team members in communication and completion of tasks.
Position	**Name (Organization)**	**Role/Responsibilities**
Research Assistants / Data Analysts	UPenn and SI	Team of students including geospatial analysts and data scientists to provide technical support to the Team Leader as needed with data processing and analysis.
INRM Support	DAI	Support team for procurement and subcontracting, and to provide overall oversight and quality control. Also includes Communication and Knowledge Management and Gender Equality and Social Inclusion specialists.

Timeline

Table 15 illustrates timeline for the RESTORE evaluation baseline.

Table 15: Timeline

Tasks		Output/Deliverable	Timeline
Contracting and Tools Development			
1	Develop and issue request for proposal for data collection subcontractor(s)	Scope of work and request for proposal	Sep/Oct-23
2	Draft data collection protocols and instruments/tools for both quantitative and qualitative data collection	Draft data collection instruments	Oct/Nov-23
3	Finalize data collection instruments	Final data collection instruments	Nov-23
4	Submit application for review to the IRB	Package of all IRB submission requirements	Nov-23
5	Subcontract to local partner organizations	Contract signed with local survey organization and ecological data collection organizations	Dec-23
Data Collection			
1	Conduct community listing to develop sampling frame in line with final sampling design	Community listing data	Dec/Jan-24
2	Select communities for data collection	List of communities for baseline data collection	Dec/Jan-24
3	Translate interview guides and questionnaires	Translated interview guides and questionnaires	Dec/Jan-24
4	Program electronic version of questionnaires for data collection	Programmed data collection forms	Dec/Jan-24
5	Conduct questionnaire pretest	Questionnaire pretest report (to be included with training/pilot report)	Dec/Jan-24
6	Procure supplies and equipment (tablets, personal protective equipment, and equipment for camera traps)		Dec/Jan-24
7	Prepare survey manuals for interviewers, supervisors, etc.	Customized manuals	Dec/Jan-24
8	Develop DQA plan	Data quality assurance plan	Dec/Jan-24
Data Collection			
9	Develop fieldwork management and monitoring plan, including regular progress reports throughout fieldwork	Fieldwork monitoring plan	Dec/Jan-24
10	Develop interviewer training plans and supporting materials	Training plan and agenda, training materials, quizzes/role play exercises, etc.	Dec/Jan-24
11	Ensure that IRB approval has been received	Approval from certified IRB	Dec/Jan-24
12	Implement training of trainers		Jan-24
13	Implement interviewer training		Jan-24
14	Implement pilot (as part of interviewer training)	Interviewer training and pilot report	Jan-24

Tasks		Output/Deliverable	Timeline
15	Implement data entry/data management pilot (as part of all-systems fieldwork pilot)		Jan-24
16	Implement fieldwork	Weekly fieldwork report, plus summary fieldwork report at end of data collection activities	Jan/Feb-24
17	Conduct DQA throughout fieldwork	Weekly DQA checks and reports	Jan/Feb-24
Analysis and Reporting			
1	Identification and processing of remote sensing data	Remote sensing data for analysis	Jan – April 2024
2	Data quality assessment, including assessment of response rates, results of DQA checks, and any other pertinent information regarding data quality	Code and other documentation as relevant	Mar-24
3	Clean the data	Code and other documentation as relevant	Mar/April-24
4	Construct indicators to be used for analysis	Code and other documentation as relevant	April/May-24
5	Analyze the data	Code and other documentation as relevant	May/June-24
6	Prepare final report tables		May/June-24
7	Draft final report	Draft final report	June/July-24
8	Virtual dissemination for key stakeholders	Presentations and other materials used	Jul-24
9	Final report, incorporating feedback from dissemination	Final report	Aug-24
10	Prepare protocol for rendering data suitable for public use		Aug-24
11	Prepare non-public access data files (maintains some PII, e.g., GPS coordinates)	Non-public access data files and supporting materials	Sep-24
12	Prepare restricted access data files	Restricted access data files and supporting materials	Sep-24
13	Prepare public access data files (excludes PII)	Public access data files and supporting materials	Sep-24
14	Prepare pre-analysis plan and register	Registered pre-analysis plan	Sep-24

References

Antonarakis, A.S., Pacca, L. & Antoniades. 2022. "The effect of financial crises on deforestation: a global and regional panel data analysis." Sustain Sci 17. issn:1037–1057. https://doi.org/10.1007/s11625-021-01086-8

Antwi, Y. A. , Fischer, J. E., Freudenberger, M., & O'Sullivan, R (2021). Rooted in the ground: Reforming Ghana's forest laws to incentivize cocoabased agroforestry. Washington, DC: USAID Integrated Land and Resource Governance Task Order under the Strengthening Tenure and Resource Rights II (STARR II) Indefinite Delivery, Indefinite Quantity.

Blaser, W.J., Oppong, J., Landolt, J., Yeboah, E., and Six, J. 2018. "Climate-smart sustainable agriculture in low-to-intermediate shade agroforests." Nature Sustainability 1: e234-e239.

Chomba, Susan, Fergus Sinclair, Patrice Savadogo, Mieke Bourne, and Madelon Lohbeck. 2020. "Opportunities and Constraints for Using Farmer Managed Natural Regeneration for Land Restoration in Sub-Saharan Africa." Frontiers in Forests and Global Change 3. issn: 2624-893X.

Dohmen, M., S. Muilerman, and W. Toose. 2018. "Tree Registration Guide." World Cocoa Foundation.

Ferraro, Paul J., and Subhrendu K. Pattanayak. 2006. "Money for nothing? A call for empirical evaluation of biodiversity conservation investments" [in English]. PLoS biology 4 (4): e105–e105.

Mighty Earth. 2017. "Chocolate's Dark Secret." Retrieved from: http://www.mightyearth.org/wp-content/uploads/2017/09/chocolates_dark_secret_english_web.pdf (Accessed December 13, 2023).

Plowright, Raina K, Jamie K Reaser, Harvey Locke, Stephen J Woodley, Jonathan A Patz, Daniel J Becker, Gabriel Oppler, Peter J Hudson, and Gary M Tabor. 2021. "Land use-induced spillover: a call to action to safeguard environmental, animal, and human health." The Lancet Planetary Health 5 (4): e237–e245. https://doi.org/10.1016/S2542-5196(21)00031-0

Reaser, Tabor G. M. Becker D.-Muruthi P. Witt A. Woodley S. J. Plowright R., J. 2020. "Land use-induced spillover: priority actions for protected and con- served area managers." EcoEvoRxiv. https://doi.org/10.32942/osf.io/bmfhw

Robinson, Brian E., Margaret B. Holland, and Lisa Naughton-Treves. 2014. "Does secure land tenure save forests? A meta-analysis of the relation- ship between land tenure and tropical deforestation." Global Environmen- tal Change 29:281–293. issn: 0959-3780. https://doi.org/10.1016/j.gloenvcha.2013.05.012

Roe, Dilys, Francesca Booker, Mike Day, Wen Zhou, Sophie Allebone-Webb, Nicholas A. O. Hill, Noelle Kumpel, et al. 2015. "Are alternative livelihood projects effective at reducing local threats to specified elements of biodiversity and/or improving or maintaining the conservation status of those elements?" Environmental Evidence 4 (1): 22. https://doi.org/10.1186/s13750-015-0048-1

Samii, Cyrus, Matthew Lisiecki, Parashar Kulkarni, Laura Paler, Larry Chavis, Birte Snilstveit, Martina Vojtkova, and Emma Gallagher. 2014. "Effects of Payment for Environmental Services (PES) on Deforestation and Poverty in Low and Middle Income Countries: A Systematic Review." Campbell Systematic Reviews 10 (1): 1–95. https://doi.org/https://doi.org/10.4073/ csr.2014.11. eprint: https://onlinelibrary.wiley.com/doi/pdf/10.4073/csr. 2014.11.

Shyamsundar, Priya, Laura Aileen Sauls, Jennifer Zavaleta Cheek, Kira Sullivan-Wiley, J.T. Erbaugh, P.P. Krishnapriya. 2021. "Global forces of change: Implications for forest-poverty dynamics." Forest Policy and Economics (133). ISSN 1389-9341. https://doi.org/10.1016/j.forpol.2021.102607

Sokolow, Susanne H, Nicole Nova, Kim M Pepin, Alison J Peel, Juliet RC Pul-liam, Kezia Manlove, Paul C Cross, Daniel J Becker, Raina K Plowright, Hamish McCallum, et al. 2019. "Ecological interventions to

prevent and manage zoonotic pathogen spillover." Philosophical Transactions of the Royal Society B 374 (1782): 20180342.

Tolisano, Jim, David Bledsoe, Samantha Cheng, Heather Huntington, Kavita MacLeod, Yuliya Panfil, and Elisa Scalise. 2022. Cocoa for Climate Partnership: Pre- Workshop Assessment Report. Technical report. Integrated Natural Resource Management.

Tschora, Héloïse, and Francesco Cherubini. "Co-benefits and trade-offs of agroforestry for climate change mitigation and other sustainability goals in West Africa." Global Ecology and Conservation 22 (2020): e00919.

Tseng, Tzu-Wei Joy, Brian E. Robinson, Marc F. Bellemare, Ariel BenYishay, Allen Blackman, Timothy Boucher, Malcolm Childress, et al. 2021. "Influ- ence of land tenure interventions on human well-being and environmental outcomes." Nature Sustainability 4 (3): 242–251. https://doi.org/10.1038/s41893-020-00648-5. USAID. Climate Strategy 2022-2030.

Annex

Annex 1: West Africa HEARTH Co-Creation high level TOC