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Evaluation of the "Supporting Deforestation Free Cocoa in Ghana" Project Bridge Phase: Evaluation Design Report

Communications, Evidence, and Learning (CEL) Project Work Assignment – E3 Land and Urban Office

APRIL 19, 2019

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Evaluation of the "Supporting Deforestation Free Cocoa in Ghana" Project Bridge Phase: Evaluation Design Report

Communications, Evidence and Learning (CEL) Project

April 19, 2019

USAID Contract Number: GS00F061GA

Developed under the Communications, Evidence and Learning (CEL) Project

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ACRONYMS

ADS	Automated Directives System
CEL	Communications, Evidence, and Learning
CFI	Cocoa and Forests Initiative
Cocobod	Ghana Cocoa Board
CREMA	Community Resource Management Area
CSA	Climate-Smart Agriculture
CSSVD	Cocoa Swollen Shoot Virus Disease
DEC	Development Experience Clearinghouse
DID	Difference-in-Difference
E3	Bureau for Economic Growth, Education, and Environment (USAID)
ECOM	ECOM Agroindustrial Corp
EDR	Evaluation Design Report
GCFRP	Ghana Cocoa Forest REDD+ Programme
GD	Group Discussion
GHG	Greenhouse Gas
GOG	Government of Ghana
HIA	Hotspot Intervention Area
ILRG	Integrated Land and Resource Governance Task Order
IP	Implementing Partner
KII	Key Informant Interview
LU	Office of Land and Urban (USAID/E3)
PE	Performance Evaluation
RCT	Randomized Controlled Trial
SOW	Statement of Work
STARR II	Strengthening Tenure and Resource Rights II
TGCC	Tenure and Global Climate Change
TOC	Theory of Change
USAID	United States Agency for International Development

INTRODUCTION

This document describes the proposed design, research methodology, work plan, team composition, and estimated budget for a mixed-methods performance evaluation of the United States Agency for International Development's (USAID) "Supporting Deforestation Free Cocoa in Ghana" project Bridge Phase. USAID's Office of Land and Urban in the Bureau for Economic Growth, Education, and Environment (USAID/E3/LU) commissioned the Communications, Evidence and Learning (CEL) Project to conduct this evaluation.

To meet the learning interests of USAID and IPs for the Bridge Phase activities -- and given the complexity of the three Bridge Phase interventions, which vary in scope, geography, selection criteria for beneficiaries, and anticipated timeline for maturation of key outcomes -- this mixed-methods evaluation will use different analytic approaches to assess the effects of each of the three Bridge Phase interventions. The three interventions are focused on: (1) cocoa farm rehabilitation; (2) tenure documentation; and (3) village-level land use planning. At USAID's request, the evaluation is designed to aim for as rigorous a quasi-experimental design as possible, within available budget, recognizing that the small scale of implementation for the Bridge Phase activities is a limitation on evaluation rigor and power. An RCT design was not considered feasible for this Bridge Phase, given the short time frame to finalize implementation design and work with collaborating private-sector partner implementation needs.

To increase the learning potential from the evaluation, the evaluation will use quasi-experimental approaches for the two farmer-level interventions: the farm rehabilitation service and the tenure documentation service. Effects of the farm rehabilitation intervention will be assessed using a regression discontinuity approach. Effects of the tenure documentation intervention will be assessed using a difference-in-difference with statistical matching approach. A pre-post qualitative approach will be used to assess outcomes for the land use planning component, which is not amenable to a quasi-experimental design due to the small number of implementation villages.

The evaluation will collect qualitative and quantitative data at baseline and endline from farmers in the four Bridge Phase villages and in eight comparison group villages. The comparison group villages are communities in the same district, and where the farm rehabilitation service has also been offered, but the tenure documentation and village-level land use planning interventions will not be implemented.

BRIDGE PHASE ACTIVITY DESCRIPTION

BRIDGE PHASE ACTIVITY BACKGROUND AND OVERVIEW

Ghana and Cote d'Ivoire together produce two-thirds of the world's cocoa. Cocoa plays a critically important role in the local and national economies, providing jobs, improved livelihoods and social welfare, expanded tax base, family and corporate income, and foreign exchange earnings growth. However, the long-term viability of cocoa farming is at risk in many parts of Ghana and Cote d'Ivoire due to climate change[1], and for many years smallholder cocoa has been the leading agricultural commodity driving deforestation in both countries. This deforestation increases greenhouse gas emissions and has a negative impact on biodiversity, soil fertility, water quality and quantity, and affects local rainfall and threatens farmer livelihoods. In response, the governments of both countries and

[1] *Predicting the Impacts of Climate Change on the Cocoa-Growing Regions of Ghana and Cote d'Ivoire* (2011), International Center for Tropical Agriculture.

commodity buyers have made specific commitments to reduce and eliminate deforestation from their supply chains through the creation of initiatives such as the Cocoa and Forests Initiative (CFI) and the Ghana Cocoa Forest REDD+ Programme (GCFRP) that will sell carbon credits to the Forest Carbon Partnership Facility.

Declining productivity of cocoa farms represents an additional challenge facing the West African cocoa sector. In Ghana, up to 40 percent of cocoa farms have low productivity and the Ghana Cocoa Board (Cocobod) has estimated that 700,000 ha of cocoa farms need to be replanted. There are several challenges to large-scale farm rehabilitation. Farmers and communities lack the funding, labor resources, and technical know-how to replant old trees using best practices to rehabilitate old cocoa farms to be higher yielding and more resilient. Many farmers also have insecure land tenure arrangements that prevent or discourage them from replanting old farms and need help to improve tenure security.

Within this context, from October 2016 – January 2018, USAID funded a pilot through the Tenure and Global Climate Change (TGCC) program to identify challenges and solutions to improving cocoa sustainability in Ghana. The pilot project was carried out with private sector partners ECOM Agroindustrial Corp. (ECOM) and the Hershey Company (Hershey). The work included extensive background research, consultation, and a field pilot in Nyame Nnae community in Asankrangwa to demonstrate how to address several challenges, including improving land tenure, tree tenure, and financing cocoa rehabilitation to improve cocoa productivity.[2]

These partners are interested in scaling up this work to have a landscape level impact on forests, communities and productivity, but there is also a recognition that the current models for Farm Rehabilitation and Land Documentation need refinement both in terms of their technical implementation and financial sustainability. In particular, more work is needed to refine the financial model for farm rehabilitation services. Similarly, while the technical elements of farm documentation were demonstrated during the USAID pilot, opportunities for farmers to self-finance tenure documentation were not adequately explored. The connections between farm rehabilitation and improved land governance, including land use planning, and reduced deforestation and carbon emissions were also not examined in the pilot due to the short timeframe and small sample size. It was assumed that further landscape level governance and planning work would be needed to drive these forest protection and restoration results. Lessons can be drawn from other parts of Ghana, but the high degree of individual and family land holdings (including of secondary or fallow forests), lack of communally held lands, and lack of strong land governance institutions requires tailoring a new approach for Wassa Amenfi West. Lastly, attention to food security, gender, and social inclusion were also identified as issues to be factored into follow-on work[3].

The Integrated Land and Resource Governance (ILRG) task order under the Strengthening Tenure and Resource Rights II (STARR II) Indefinite Delivery/Indefinite Quantity (IDIQ) contract, managed by the United States Agency for International Development's (USAID) Land and Urban Office, is continuing this work on sustainability of deforestation-free cocoa.

This current activity, to be evaluated through the proposed design set out in this EDR, is the

[2] For more detail see *Improving Tenure Security to Support Sustainable Cocoa – Final Report & Lessons Learned.* A longer summary and link to the final report can be found here: https://www.land-links.org/document/tgcc-ghana-final-report-and-lessons-learned-improving-tenure-security-to-support-sustainable-cocoa/. Additional documentation produced by the project is available here: https://www.land-links.org/project/ghana-tenure-global-climate-change/

[3] See O'Sullivan, R., Freudenberger, M., Herrera, A., Moulianitaki, B., & Vaassen, T. (2019). *Supporting Deforestation-Free Cocoa in Ghana: Implementation Plan.* Washington, DC: USAID Integrated Land and Resource Governance Task Order under the Strengthening Tenure and Resource Rights II (STARR II) IDIQ.

"Supporting Deforestation Free Cocoa in Ghana" project Bridge Phase, a two-year follow-on activity to the earlier pilot activity. The goal of the partnership is to further refine the interventions (via a "Bridge Phase") and then scale up a financially viable farm rehabilitation and land tenure strengthening model for the Ghanaian cocoa sector that, in combination with land use planning, will result in reduced deforestation and GHG emissions and increased carbon sequestration in the cocoa landscape, increased cocoa farm productivity and resilience, diversified farmer incomes, and improved livelihoods. Working with the private sector to support viable business models will draw on the resources and expertise of private sector partners needed to help Ghana on its journey to self-reliance[4].

The Bridge Phase will focus on further testing and refining three components of the approach[5]:

1. ECOM's Farm Rehabilitation Services, to develop a commercially viable model that can be offered to farmers at scale that increases cocoa yield, shade trees and carbon sequestration in the long term; and increases farmer income and resilience.
2. A cost-recovery model for cocoa farm documentation services, which may involve ECOM's field agents to collect repayment of the farm documentation services over time.
3. An approach to landscape-scale governance and land use planning at village and district level in Asankrangwa to ensure that that GHG emissions from cocoa farms, secondary forests and primary forests are reduced, halted, or reversed (where feasible).[6]

The planned scope for each of these components is described below[7]:

Farm Rehabilitation Services

ECOM will lead refinement of their Farm Rehabilitation Services over two growing seasons (2019 and 2020). This may include testing different agronomy practices and cash crops to reduce seedling mortality and increase cash flow, new soil testing technology, DNA testing for disease, insurance for crop protection (if available), and a loan guarantee to support the Bridge Phase and subsequent scale-up. Across the full range of implementation, learning will identify financial, technical, and governance (enabling conditions) barriers to success and scale-up. ECOM anticipates funding farm rehabilitation for 51 farmers on approximately 187 acres of cocoa farms in Asankrangwa during 2019. The service was offered in communities targeted by the Bridge Phase and an additional eight communities in the district, and the 51 farmers were selected on the basis of 10 fixed eligibility criteria[8]. A second round of the farm rehabilitation service package may be offered in 2020 by ECOM, but this is uncertain.

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4 Ibid.

5 Per O'Sullivan, R. et al. 2019. *Supporting Deforestation Free Cocoa in Ghana: Implementation Plan.* Washington, DC: USAID Integrated Land and Resource Governance Task Order under the Strengthening Tenure and Resource Rights II (STARR II) IDIQ.

6 GHG emissions from tree felling in cocoa farms can be halted or reduced when existing shade trees are protected and reversed when new shade trees are planted. GHG emissions from deforestation and forest degradation in secondary forests can be halted or reduced and reversed if they are not converted to cocoa farms and if carbon stocks are increasing via forest regeneration towards the equilibrium state. GHG emissions from deforestation and forest degradation in primary forest and the forest reserves are likely to be reduced or halted only, unless there is scope for reversal via the reduction of degradation pressures such as reduction in timber harvesting.

7 Ibid.

8 Per most recent IP update (13 March 2019), sensitization had been conducted in some 12 communities, and 51 farmers were registered into the farm rehabilitation service program and had signed MoUs, covering 187 acres. Of the 51 farmers, 7 are from the Bridge Phase communities and had farms covering approximately 28 acres. The number of farmers who expressed interest in the program but did not proceed to the registration phase was not available from IPs at time of evaluation design.

Cost-recovery farm tenure documentation

Hershey and Meridia will work together to further develop and test the business case for farm tenure documentation. This includes examining issues of affordability, availability, accessibility, efficiency, effectiveness, and sustainability, with a focus on access to vulnerable populations and connections to land use planning. Options to reduce total costs to farmers, along with financing packages and payment recovery by ECOM, will be explored. ILRG will provide overall technical supervision of the work and USAID may provide technical assistance and/or contract with Meridia as a service provider through ILRG. This fee-for-service component, which includes farm mapping and provisioning of tenure documentation, will be rolled out in the four Bridge Phase communities and available to any interested farmer.

Landscape governance and land-use planning

ILRG will lead the component to develop an approach for landscape governance and land use planning, which will also be implemented in each of the four Bridge Phase communities. This will include applied research and analysis to identify in an iterative fashion with multiple stakeholders a land use planning approach relevant to the environmental and socio-economic contexts of Wassa Amenfi West District and particularly in the Asankrangwa Stool. It is anticipated that the socio-economic and environmental contexts of Asankrangwa are similar to other cocoa growing areas in the Western Region and other areas across the cocoa growing landscape.

The central objective of this activity is to define approaches and strategies for reducing deforestation in primary forests bordering the district and secondary tree stands held primarily on individual family lands. Participatory and inclusive land use planning is expected to focus on how to adapt existing government of Ghana approaches to spatial land use planning and decentralized governance in cocoa growing regions in Ghana. The land use planning approach must define the roles and responsibilities of both customary and statutory authorities, suitability of using a CREMA or other state-of-the-art community-based planning practices, while also taking into account the GCFRP managed by the Forestry Commission. The land use planning process must identify incentives for local communities' engagement, for without their adherence, the initiative will be no more than another "top-down" spatial planning exercise of little relevance to local actors. ILRG will fund this research and development, but IPs anticipate additional funding will be needed to fully test and scale up this component.

The Bridge Phase will result in a decision by partners whether or not they will scale up the approach, and if so, the timeline and costs required to do so. Scaling up will require substantial private financing for farm rehabilitation and tenure security that may come from a combination of ECOM, Hershey, other companies, Ghanaian financial institutions, or international financial institutions. The Bridge Phase will aim to reduce risks to this investment and identify options to reduce risk further during scale-up.

DEVELOPMENT HYPOTHESIS

Figure 1 presents the IP's theory of change (TOC) for the overall activity[9]. The activity is comprised of three sub-components: farm-level land tenure documentation, farm rehabilitation services and land use planning within implementation communities. USAID expects that providing farm-level tenure documentation to cocoa farmers will improve farmer's tenure security, spur greater agricultural investment in their farms, and ease barriers for farmers to access pre-financed cocoa farm rehabilitation services. In turn, greater farm investments are hypothesized to lead to higher productivity and farm

[9] Per O'Sullivan, R. et al. 2019. *Supporting Deforestation Free Cocoa in Ghana: Implementation Plan.* Washington, DC: USAID Integrated Land and Resource Governance Task Order under the Strengthening Tenure and Resource Rights II (STARR II) IDIQ.

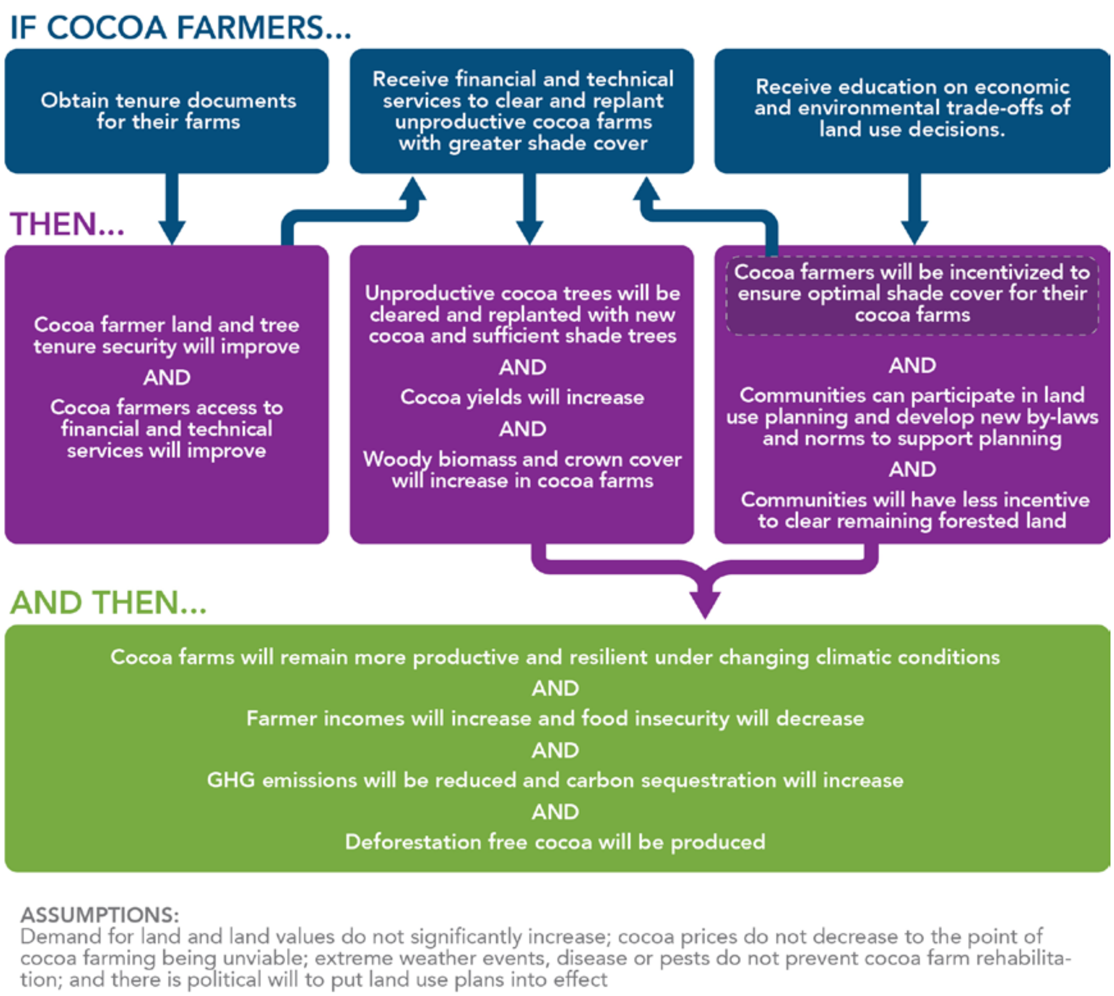
income (cocoa or food crop), and potentially alter farmer land-use decisions around fallowing, secondary forest maintenance, and conversion of additional land for food crops and/or cocoa.

USAID believes that provisioning of a pre-financed model for farm rehabilitation services by private sector partners will improve cocoa farmer access and uptake of cocoa farm replanting, which will eventually lead to improved cocoa productivity, farmer income, and carbon storage in cocoa farming systems, while reducing pressure for farmers to clear additional land for conversion to cocoa.

In addition, USAID believes that community-wide land use planning will result in identification and consensus on future land use arrangements in the community, including planning and development of community by-laws for agriculture and forest land uses. In turn, this is expected to lead to reduced clearing of secondary forest in the communities and increased carbon sequestration in the landscape.

Lastly, USAID expects that the integration of these three activity components (farm-level tenure documentation, provisioning of pre-financed cocoa farm rehabilitation services, and community-wide land use planning) at scale will result in landscape-scale improvements in secondary forest area, carbon sequestration, farmer livelihoods and food security. An overview of relevant theory and empirical results from existing literature is presented in Annex I.

FIGURE 1: BRIDGE PHASE ACTIVITY THEORY OF CHANGE



EVALUATION PURPOSE, AUDIENCE, AND INTENDED USES

PURPOSE

The overarching purpose of the Bridge Phase evaluation is to (1) provide an evidence base for outcomes of the Bridge Phase activities with respect to strengthening land rights and land governance, reducing deforestation, increasing carbon sequestration and cocoa productivity, and enhancing local livelihoods; and (2) provide targeted learning on key knowledge and theory of change logic gaps to inform the design of a landscape-scale project that will follow the Bridge Phase.

AUDIENCE

USAID/E3/LU, USAID/E3/GCC, USAID/Ghana, the Bridge Phase implementing partners, and the private sector firms involved in the Bridge Phase are the primary audiences for the evaluation results. Key secondary audiences of the evaluation results include the broader donor community and interested private sector firms – particularly those working on land policy, land use planning linked to sustainable landscape objectives, and integrating land tenure strengthening activities into cocoa farm rehabilitation services.

INTENDED USES

The evaluation findings are expected to have accountability and learning value to USAID, including the Office of Land and Urban and the Office of Global Climate Change. The evaluation will inform the design of future activities that aim to integrate farm-level land tenure strengthening, farm rehabilitation services and community-wide land use planning to strengthen tenure security, enhance smallholder livelihoods and reduce deforestation, as well as activities aiming to improve the sustainability of commodity chains. It is also intended to provide targeted learning on key knowledge and theory of change logic gaps to inform the design of a landscape-scale project that may follow the Bridge Phase.

EVALUATION QUESTIONS

The evaluation will use a mixed-methods approach to answer the evaluation questions below, which were developed in conjunction with USAID and Bridge Phase IPs, and reflect specific learning objectives for the Bridge Phase. See Annex II for an Evaluation Design Matrix summarizing data sources, outcome measures and analytic approach by evaluation question.

Evaluation Question 1: Tenure Documentation Effects on Tenure Security

1. What are the effects of land tenure documentation on tenure security for cocoa farmers in Bridge Phase villages, and key reasons why[10]? This also includes attention to the following sub-questions:
    a. What was the extent of parcel mapping and provisioning of land tenure documentation?
    b. Were there any challenges encountered with respect to participation in tenure documentation activities, and how were these resolved?

[10] USAID expressed interest in a focus on mechanisms for improved tenure security through this EQ. The Evaluation Team has maintained a focus on reasons, rather than mechanisms, since the anticipated quantitative sample and evaluation design may not permit a robust understanding of causal mechanisms during the Bridge Phase evaluation timeframe. The triangulated quantitative and qualitative data will, however, enable an understanding of contributing reasons to any observed changes in tenure security during the evaluation timeframe.

c. How did Bridge Phase tenure documentation activities affect household perceptions of tenure security, and anticipated investment and livelihood follow-on outcomes?
d. Given that this activity was provided as fee-for-service, with individuals in the Bridge Phase communities self-selecting into this activity, what types of households and farmers were more likely to pay for and obtain farm-level documentation? For what types of farm holdings?

Evaluation Question 2: Tenure Security and Farm Rehabilitation Linkages

2. How does farmer tenure security relate to interest, uptake and outcomes of cocoa farm rehabilitation services? This includes a focus on:
    a. Controlling for other household and farm-level factors, were farmers who received farm tenure documentation during the Bridge Phase more likely to participate in the second round of farm rehabilitation services offered at the end of the Bridge Phase?
    b. How does tenure documentation increase interest in, and ease the ability for farmers to participate in farm rehabilitation services?
    c. What are the effects of higher tenure security on farm rehabilitation intermediate outcomes (farm investments, productivity, revenues, amount of new land clearing) at the end of the Bridge Phase?

The evaluation team notes there are some limitations on the extent this question can be answered through the Bridge Phase. Initial farm rehabilitation beneficiaries were not required to have land documentation as part of the rehabilitation eligibility criteria, but may have higher baseline tenure security relative to farmers not selected into the service. The evaluation team anticipated examining how receipt of farm tenure documentation through the Bridge Phase affects interest and uptake for the second round of farm rehabilitation services offered, if tenure documents are distributed before the second farm rehabilitation offering is made. However, there is a possibility that IPs may not offer a second round of the rehabilitation service. The evaluation team will also measure this through inclusion of survey questions on hypothetical interest and participation in another rehabilitation round, although this is not as reliable as measuring actual uptake.

Evaluation Question 3: Farm Rehabilitation and Secondary Forest Clearing Linkages, and impacts on GHG emissions

3. To what extent and in what ways does cocoa farm rehabilitation lead to reduced deforestation and greenhouse gas (GHG) emissions in secondary forests and increased carbon sequestration in rehabilitated cocoa farms?
    a. What is the effect of farm rehabilitation on cocoa farm carbon stocks and sequestration projections, fallowing decisions, amount of secondary forest clearing and broader household land use decisions, for farmers engaged in farm rehabilitation during the Bridge Phase timeframe?
    b. What are reasons for any observed changes in land use decisions during the Bridge Phase?

The evaluation team notes this question may not be robustly answerable within the Bridge Phase evaluation time frame, since the full outcomes of farm rehabilitation services are not expected to be realized by farmers until several years after endline data collection for the Bridge Phase evaluation. In addition, the small sample size of farmers who receive farm rehabilitation services during the evaluation time frame may limit the broad generalizability of findings. The evaluation team will however, measure and report on intermediate measures of farmer changes in land use decision-making behavior and secondary forest clearing, with the understanding that interim changes in land use behavior may not accurately reflect their decisions once the full time frame for cocoa farm rehabilitation and intensification has been achieved.

Evaluation Question 4: Land Use Planning and Secondary Forest Clearing Linkages

4. To what extent and in what ways does spatially-based territorial land use planning (LUP) at multiple scales lead to reduced deforestation and greenhouse gas (GHG) emissions in secondary forests? This includes a focus on the following sub-question:
   a. What is the effectiveness of the Eco Game as a tool to elicit land use planning behavior change and actions?
   b. If not as effective as anticipated, what alternative tools and approaches might future programs consider piloting?

The evaluation team notes that the Bridge Phase evaluation focuses on secondary forests, not forest reserves under Government authority, because Bridge Phase implementation activities aim to have a direct and measurable influence on household and community use of secondary forests in their communities as a core focus, while deforestation and degradation processes in Government-controlled forest reserves in the area are influenced by many other activities (such as government-sanctioned logging by the state) that are outside the control or direct influence of the Bridge Phase project.

Evaluation Question 5: Influence of Context Characteristics on Outcomes

5. How are key individual farmer, farm-level, household and village context characteristics associated with Bridge Phase tenure security, farm rehabilitation, and land use outcomes? Characteristics to be examined include:
   a. Individual / Farmer: Age, gender, tenancy status (indigene or *asidee* vs. *abunu*), education.
   b. Farm-level: Cocoa farm age, farm size.
   c. Household: Total farm holdings; wealth status.
   d. Village[11]: Secondary forest scarcity, social and governance dynamics, market context.

Evaluation Question 6: Key Lessons to Inform Potential Scale-Up of Integrated Tenure Documentation, Farm Rehabilitation and Community Land Use Planning Activities

6. What are the key learning lessons on financial, technical and governance barriers (or enabling conditions) that must be overcome to enable effective scale-up of the integrated Bridge Phase activities, and likelihood of achieving landscape-scale improvements on: strengthening land rights, increasing cocoa productivity, reducing deforestation, increasing carbon stocks, and enhancing local livelihoods? This includes a focus on:
   a. What are main reasons that households or farmers chose not to participate in any of the Bridge Phase activities? To what extent can future activities address these barriers?
   b. Did Bridge Phase activities reach intended targeted populations, and key sub-groups of interest? (for example: less tenure secure, farmers with declining cocoa productivity)
   c. What do the Bridge Phase evaluation findings on intermediate results for each of the three program sub-components suggest with respect to longer term opportunities for improved tenure security, effects on cocoa productivity and livelihoods, and forest land use decisions? (The three program sub-components are: farm tenure documentation, pre-financed farm rehabilitation services, community land use planning)

[11] Examination of the role of village level factors and comparisons across village-level context will be limited by the small number of implementation villages in the sample (4), but will also be triangulated through qualitative data collection.

d. What external factors, if any, positively or negatively influenced the ability for Bridge Phase activities to achieve intended results?

In addition to the Evaluation questions listed above, USAID and IPs highlighted several additional learning interests for this evaluation, which may also contribute to informing IP and USAID decisions on activity scaling after the Bridge Phase. These interests are listed below, together with discussion on if and how the evaluation team anticipates addressing them through the baseline study and/or final evaluation.

Specific Learning Interest	**If and How Addressed through Bridge Phase Evaluation**
1. Do farmers who receive the bundle of farm renovation services and land tenure documentation have different outcomes from those who only receive farm renovation services?	This question will not be possible to answer robustly through the Bridge Phase evaluation, because the Bridge Phase treatment sample for the farm rehabilitation component is too small and insufficiently powered to be viable for conducting tests of sub-group effects across rehab only and rehab + tenure documentation farmers. This is especially the case given that, per IP documentation, the final farm rehabilitation treatment sample consists of only seven farmers across the four Bridge Phase villages that will receive the tenure documentation component. Moreover, since farmers will self-select into tenure documentation, the number of rehab with or without tenure documentation farmers will not be known until endline.
2. What is the effectiveness of the Eco Game as a tool to elicit land use planning behavior change and actions? If not as effective as anticipated, what alternative tools and approaches might future programs consider piloting?	The evaluation team has incorporated this into EQ 4.
3. What are the motivations behind why new migrants from other areas of Ghana are currently in-migrating to Asankrangwa area to do *Abunu* farming?	The evaluation team will include coverage on this issue in the quantitative and qualitative baseline instruments, and will report out on this in the baseline report.
4. If and how have Bridge Phase activities helped women cocoa farmers overcome their labor constraints?	Bridge Phase activities are not specifically design to address this issue, however the evaluation will analyze and report out on gender-disaggregated results to the extent possible for each EQ, include attention to this. If a gendered focus on specific issues emerges during the Bridge Phase project, the evaluation team will also aim to incorporate coverage on these issues to the extent possible during endline data collection.
5. If and how does a gender and social inclusion approach benefit more vulnerable (poorer) people within communities and attain project objectives?	The evaluation will analyze and report out on gender- and wealth-disaggregated results to the extent possible for each EQ.
6. What is the viability of farmer financed tenure documentation?	This issue will be addressed through EQ 6, and also informed by EQ1.
7. To what extent and in what ways does cocoa farm rehabilitation lead to reduced deforestation and greenhouse gas (GHG) emissions in secondary forests?	This question was proposed by USAID, and has been included as EQ 4. The evaluation team cautions that this question may not be robustly answerable within the Bridge Phase evaluation time frame, since the full outcomes of farm rehabilitation services will not be realized by farmers until several years after endline data collection for the Bridge Phase evaluation. In addition, the small sample size of farmers who receive farm rehabilitation services during the evaluation time frame may limit the broad generalizability of findings. The evaluation team will, however, measure and report on intermediate indicators of farmer changes in land use decision-making behavior and secondary forest clearing, with the understanding that interim changes in land use behavior may not accurately reflect their decisions once the full time frame for cocoa farm rehabilitation and intensification has been achieved.

GENDER ASPECTS OF EVALUATION QUESTIONS

The evaluation will consider the gender-specific and differential effects of the Bridge Phase activities, as per USAID's Gender Equality and Female Empowerment Policy and Automated Directives System (ADS) 205. Quantitative and qualitative data collection for this evaluation will be structured to enable gender-disaggregated analysis on key outcomes where possible and to identify gender differences with respect to program access, behavior change and outcomes, and lessons learned from female community members. Qualitative data collection and analysis will also devote particular attention to investigating differential impacts by gender. In addition, the evaluation team will conduct further inquiry on gender themes as they emerge during data analysis. Different types of female respondents, including women cocoa farmers, wives in male-headed households, and women in female-headed households, will be targeted for their perspectives. Each of the evaluation questions present different opportunities for understanding the unique perspectives and experiences of men and women.

PROPOSED EVALUATION DESIGN

DESIGN OVERVIEW

The Bridge Phase interventions will be conducted in four communities. Across these communities, the treatment N is seven farmers for cocoa farm rehabilitation (covering a total of 28 acres), and an estimated 1,360 farmers who may choose to receive land tenure documentation. Village-wide land use planning activities will be rolled out in each of the four communities. In addition, the farm rehabilitation service was offered in eight additional communities to reach a total sample of 51 farmers. It is important to note that these three main Bridge Phase activities vary in scope, geography, selection criteria for beneficiaries, and the anticipated timeframe for maturation of key outcomes.

As a result, this mixed-methods evaluation will use different analytic approaches to assess the effects of each of the three Bridge Phase interventions, as summarized in Table 1. The evaluation will collect qualitative and quantitative data at baseline and endline from farmers in the four Bridge Phase villages and in eight comparison group villages in Asankrangwa where ECOM also offered the rehabilitation service to farmers. The sample size for the quantitative component will be 960 households, consisting of 80 households surveyed in each of 12 villages. The baseline data collection round will occur shortly before the implementation of Bridge Phase activities, in May 2019. The endline round will take place towards the conclusion of Bridge Phase activities, currently anticipated for mid-2021, in order to leave sufficient time for endline analyses to inform activity scaling decisions. The endline will replicate the baseline data collection and provide for additional targeted follow-up questions for the qualitative data collection on specific issues as identified from baseline results and/or implementation processes during the Bridge Phase.

The evaluation will conduct quasi-experimental analyses of the two farmer-level interventions: the farm rehabilitation service and the tenure documentation service. It will conduct a pre-post qualitative evaluation of the land use planning component. Quasi-experimental analyses of the household-level farm rehabilitation and/or tenure documentation interventions increases the learning potential from the evaluation. However, the viability of the proposed quasi-experimental approaches for these two interventions will depend in part on characteristics of farmers and households obtained in the baseline sample. The village-level LUP intervention is not considered amenable to a quasi-experimental design due to the small number of implementation villages[12].

[12] It is anticipated that most of the LUP activities will take place across all four implementation communities.

TABLE 1: EVALUATION DESIGN OVERVIEW		
BRIDGE PHASE INTERVENTION	EVALUATION DESIGN AND ANALYTIC APPROACH	KEY ISSUES
Farmer-level cocoa farm rehabilitation intervention	Quasi-experimental analyses using a regression discontinuity approach	Feasible if a sufficient number of non-rehabilitation farmers score similarly to those selected for rehabilitation on ECOM's eligibility criteria are obtained in the baseline sample[13]. The small treatment sample size of 51 farmers for this intervention means this analyses will only be powered to detect fairly large effects (see Annex III).
Farmer-level farm tenure documentation intervention	Quasi-experimental analyses using a Difference-in-Difference approach with statistical matching	IPs anticipate delivery of 1,360 tenure documents across the four Bridge Phase communities, but actual uptake of this service will not be known at baseline. Effective ex-post matching of taker and non-taker households within the Bridge Phase community evaluation sample is considered low[14]. To compensate the evaluation design extends data collection to the additional eight communities in Asankrangwa where ECOM offered the rehabilitation service, but will not receive tenure documentation services during the Bridge Phase. The extension of data collection to these additional communities will enable a viable pool of comparable but non-treated households for statistical matching and quasi-experimental analyses of the farm tenure documentation activity. This analysis of tenure documentation effects is powered to detect relatively small-scale effect sizes (see Annex III).
Village-level LUP component	Pre-post qualitative analyses informed by complementary household survey data	This component is not amenable to a quasi-experimental analysis due to the small number of implementation villages for the Bridge Phase (four). While a performance evaluation cannot definitively attribute LUP outcomes to the Bridge Phase activities, a pre-post analyses of the 960 household sample across 12 villages, including the four treatment villages, will still be able to shed an informative light on general relationships between LUP activities, outcomes and beneficiary perceptions. In addition, the use of qualitative data collection at baseline and endline will help to triangulate results and partially mitigate this limitation.

The proposed design for this evaluation was informed by an evaluation scoping trip conducted in November 2018. The overall purpose of the scoping trip was to: (1) collect information to inform evaluation design options, (2) visit 4-5 potential Bridge Phase implementation sites, and (3) gain a greater understanding of implementation and beneficiary context with respect to evaluation design options and logistics requirements for evaluation data collection. The trip aimed to inform proposed evaluation design options, the design of data collection tools and logistics, and planning for baseline data collection anticipated for May2019.

The data collection approach for the evaluation scoping trip consisted of group discussions held in each of six communities that were visited, conducted with representatives from the following target groups:

[13] As of 13 march 2019, IP sensitization for this component had registered 7 farmers from 2 of the 4 Bridge Phase communities, and 51 farmers in total across 10 communities. This is considered the final treatment sample for farm rehabilitation component.
[14] The reason for this expectation is that prior work on tenure documentation uptake by the implementer indicates that farmer inability to pay the cost of the document has been the primary barrier to uptake in previous work, while interest in the service also varies by farmer tenure status. Given this, the evaluation team expects non-taker households in implementation villages will disproportionately consist of poorer households (who may also be less tenure secure) or households that otherwise differ from the self-selected treatment sample in ways that also affect outcomes. Extending the evaluation data collection to a group of farmers in villages that were not offered the farm documentation service will provide a more robust comparison group for the effects of this activity.

Community leaders (chiefs and/or elders); Abunu cocoa farmers; Landlord/indigene farmers; and Women. Qualitative data collection for the evaluation scoping trip focused on the following themes: Community history and demographic characteristics; Land and tree tenure; Land and forest governance issues, including local institutional dynamics and customary norms; Level of deforestation pressure and key types of deforestation / degradation threats; Cocoa farming challenges and rehabilitation history.

The evaluation scoping trip resulted in the evaluation team obtaining substantial information on beneficiary and village implementation context to help inform Bridge Phase design and evaluation planning. All areas visited by the evaluation scoping team demonstrated high salience with respect to each of the four key thematic areas that Bridge Phase activities aim to address. Each of the communities are characterized by: (1) tenure insecurity as a constraint on land use decisions; (2) declining cocoa yields and strong interest in cocoa farm rehabilitation, without corresponding capacity for farmers to act on those interests on their own; (3) a declining forest resource base and perceived farmland and forest scarcity; and (4) dynamic land use pressures, with little precedence for communal decision-making or effective community-wide planning on the same.

The scoping findings highlighted two key challenges that are particularly relevant for implementation design, achievement of some activity objectives, and measurement reliability for the evaluation: First, there is an apparent lack of an existing village-wide institutional structure for collective decision-making within villages (whether related to land use planning or otherwise), and traditional authorities apparently have little control over land use decisions that households make on land seen as privately held by individual families. This adds a layer of difficulty for the land use planning approach and achievement of tangible results at scale in the Bridge Phase time period, because IPs will need to develop alternative approaches and systems for obtaining collective agreement on LUP in the communities. Scoping discussions in villages did find rule-making precedents for changing norms on forest resource use, which provides some basis for LUP efforts. Second, the evaluation team observed high land cover and land use heterogeneity across very small spatial scales. This typically presents challenges for reliable carbon accounting across a landscape, because substantial heterogeneity in land use and land cover across small spatial scales makes it more difficult to obtain precise estimates of carbon stocks and related factors using current approaches and technologies. These methodological challenges are widely noted in the literature and efforts to reduce uncertainties and improve on methods to accurately estimate carbon sequestration and GHG emissions in tropical smallholder landscapes is an ongoing area of research[15].

Evaluation add-on activities at endline

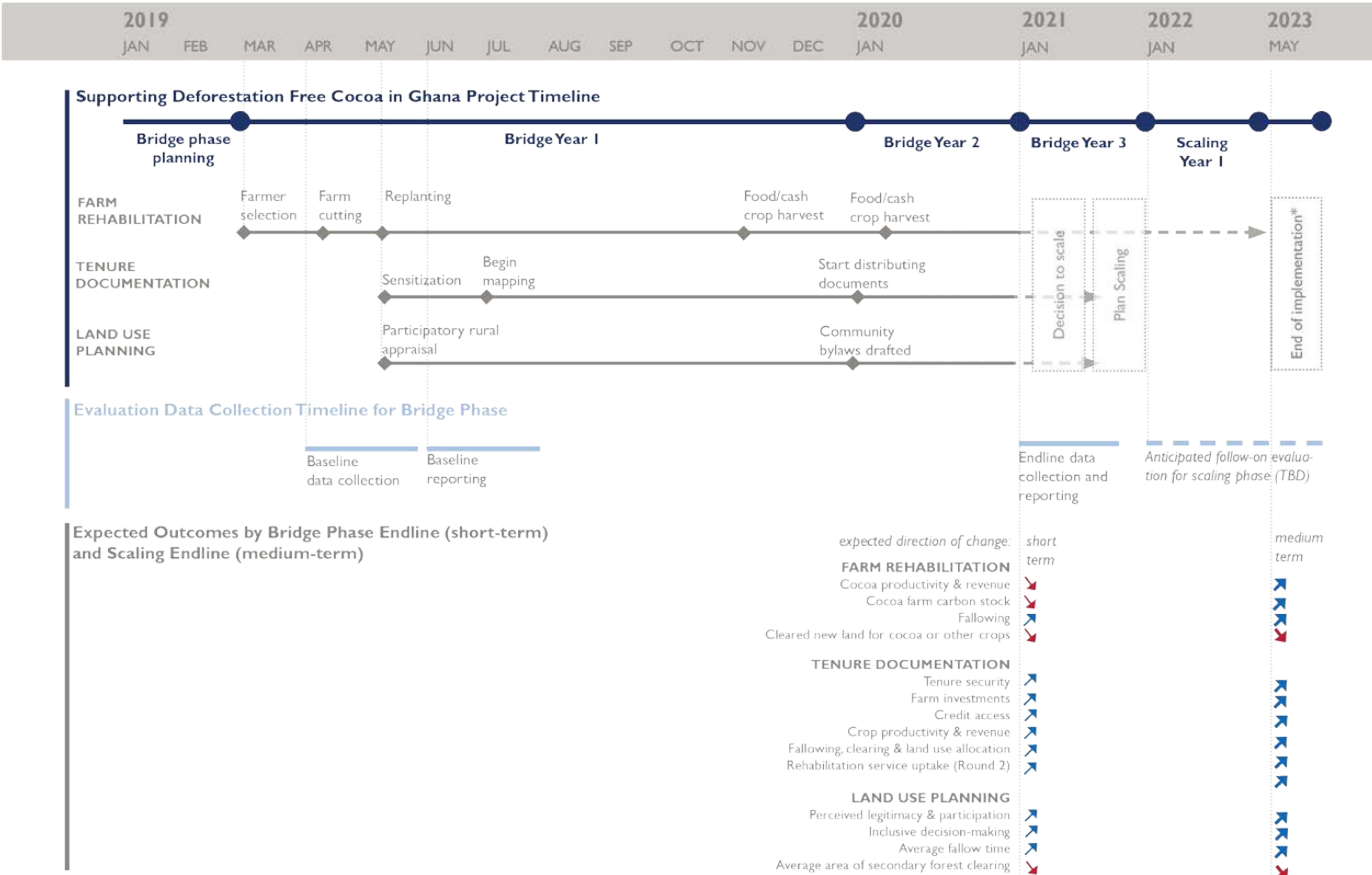
The evaluation team also proposes two additional evaluation activities to be considered as part of CEL's endline data collection and analyses for this evaluation, pending the results of baseline data collection:

- A supervised remote sensing-based land cover classification and change analyses of the Asankrangwa area that will focus on measuring and comparing 2018-2020 secondary forest cover change in the Bridge Phase implementation communities and surrounding areas.
- Model carbon sequestration potential across the landscape under various scaling scenarios, using carbon stock measurements obtained at baseline and endline from the 51 rehabilitation service farms, and a sub-set of cocoa farms that did not undergo rehabilitation.

Figure 2 presents an overview of the evaluation timeline for the Bridge Phase, anticipated timeline of Bridge Phase activities, and expected outputs and impact-level outcomes that are measurable by endline.

[15] For example, see Milne, E. et al. 2013. *Methods for the quantification of GHG emissions at the landscape level for developing countries in smallholder contexts.* Environmental Research Letters: 8.

FIGURE 2: OVERVIEW OF BRIDGE PHASE ACTIVITY AND EVALUATION TIMELINE



* Note: First cocoa harvest on Bridge Phase rehabilitated farms is expected in late 2023.

EVALUATION DESIGN DISCUSSION

The evaluation design selected by USAID expands the scope of data collection and analyses to additional villages in Asankrangwa that are not under Bridge Phase implementation, with the intent of obtaining a more rigorous quasi-experimental IE design[16]. Quantitative data collection under this evaluation design consists of 80 households surveyed in each of 12 communities (four Bridge Phase communities and eight non-Bridge Phase communities where ECOM also offered the farm rehabilitation service) for a total survey sample of 960 households. The household survey sample in these villages will consist of all farmers who reached MoU stage or registered initial expressed interest with ECOM for the farm rehabilitation service, together with a sub-set of other households. The expansion of the sample to non-Bridge Phase communities will increase the statistical power for the farm rehabilitation analyses to detect intermediate outcomes through a regression discontinuity approach. It is also expected to provide a sufficient pool of comparable households to enable effective statistical matching for quasi-experimental analyses of the farm tenure documentation outcomes (through a DID plus statistical matching approach). While this design has some gains to statistical power, and renders a quasi-experimental analyses feasible for the tenure documentation component, it still will not allow for detection of fine-scale changes that result from the interventions through this evaluation. The evaluation design described in this EDR will be powered to detect medium to large scale effects (see Annex III for power calculations, estimated minimum detectable effect sizes for a sub-set of outcomes, and additional discussion on power).

Coupled with substantive qualitative data collection in both rounds, the evaluation team considers this design to be a more cost-effective and robust approach than a non-experimental evaluation design with data collection restricted only to Bridge Phase communities, to obtain an evidence base for some of the key issues of interest to inform scaling decisions. In proposing this design, the evaluation team is also taking into account the still exploratory stage of activity design, and strong need for specific learning to refine program theories of change and inform on scaling options by Bridge Phase endline[17].

However, the evaluation team notes that with the current design, there is still some risk of obtaining null treatment effects at Bridge Phase endline on some impact-level outcomes, such as for fallowing incidence and amount of new land cleared under the farm rehabilitation service intervention (see power discussion in Annex III). This is due to a combination of: small treatment sample size for the farm rehabilitation intervention, anticipated small effect sizes overall during the timeframe of the Bridge Phase evaluation for some outcomes, and lack of maturation of some of the key impact-level outcomes during the Bridge Phase due to the longer timeframe to realize outcomes under the farm rehabilitation component. There are several intermediate outcomes that are measureable by Bridge Phase evaluation endline, but some of these may be less interesting or informative for robust validation of the program's theory of change (for example, we expect that the effect of the farm rehabilitation intervention on cocoa farm productivity, revenue and carbon stocks will each be large and negative at the end of the Bridge Phase, although these effects are anticipated to become large and positive several years beyond the end of activity implementation; see Figure 2).

[16] At USAID's request earlier iterations of this evaluation design also considered: (1) a lower-cost performance evaluation design that restricted data collection only to the four Bridge Phase communities, but would not enable quasi-experimental analyses of any of the three Bridge Phase interventions ("Option A"); and (2) dropping the regression discontinuity design to conduct a quasi-experimental analyses of the farm rehabilitation component, and associated collection of carbon stock data on comparison group farms ("Option A.1")

[17] An eventual randomized controlled trial (RCT) evaluation design is likely highly desirable for the scaling phase, when it is anticipated there will be a sufficient number of villages and farmers receiving different intervention components to enable additional and more rigorous testing of complex theory of change presented by this activity, together with an anticipated greater flexibility on the part of IPs to implement randomized selection of beneficiaries for the various project components.

BRIDGE PHASE IMPLEMENTATION COMMUNITIES

Bridge Phase implementation will take place in the initial Pilot community of Nyame Nnae (per USAID's request), and in an additional three communities of Wassa Amenfi West District: Domeabra, Suresu Nkwanta, and Yirase (Figure 3). These three new communities for the Bridge Phase were selected from a larger list of communities that were considered potentially viable for Bridge Phase implementation as identified via geospatial analyses conducted by NORC to identify areas in Asankrangwa with concentrations of older cocoa farms farmed by Hershey/ECOM clients, in areas with recent deforestation, some remnant forest cover remaining, and relatively close to forest reserve boundaries. Follow-up data scoping collection was then conducted in six communities as part of CEL scoping trip activities designed to help inform IP site selection[18]. The final selection of the three new implementation communities was made by implementing partners. Scoping trip data collection suggested that the three communities selected have concentrations of older cocoa farms and farmers interested in rehabilitation, and a high proportion of households with abunu farmers. The communities vary to some extent with respect to the level of contention on land issues and abunu contract renegotiations apparent at scoping data collection, the community-estimated level of remaining secondary forest and pressures on it, and the presence of illegal mining (galamsey) activities, as summarized in Table 2 below.

TABLE 2: KEY CHARACTERISTICS OF NEW BRIDGE PHASE IMPLEMENTATION COMMUNITIES

VILLAGE NAME	CONTENTION ON LAND ISSUES AND *ABUNU* RENEGOTIATIONS	SECONDARY FOREST (COMMUNITY-ESTIMATED)	OLD COCOA FARMS AND REHABILITATION INTEREST?	PRESENCE OF *GALAMSEY* IN COMMUNITY	ESTIMATED PROPORTION OF HOUSEHOLDS WITH *ABUNU* FARMERS
Suresu Nkwanta	Lower	High, estimated by community members at ~30% and stable due to labor & cost constraints on cocoa expansion	Yes	No	~95%
Domeabra	Very High	Low and declining	Yes	Some, but declining b/c all available areas for *galamsey* have already been taken	~80%
Yirase	High	Estimated at ~ 30% but diminishing due to cocoa farm expansion and in-migration	Yes	No	Nearly all HHs

[18] Additional details are available in: Persha, L. (2018). *Evaluation of the "Supporting Deforestation Free Cocoa in Ghana" Project Bridge Phase: Scoping Trip Report.* Washington, DC: USAID Communications, Evidence and Learning (CEL) Project.

FIGURE 3: MAP OF BRIDGE PHASE IMPLEMENTATION AREA

Note: shows approximate centers of Bridge Phase villages, as village boundary information is not yet available from implementers

INDICATORS AND OUTCOME MEASURES

The Bridge Phase evaluation will focus on measuring anticipated farm, farmer, household or community-level outcomes across each of the three Bridge Phase sub-components: farm-level tenure documentation, cocoa farm rehabilitation and community land-use planning. Initial outcomes are shown in Table 3, with the hypothesized direction of change at endline. This list will be further refined pending finalization of the EDR and elaboration of the scope and timing of Bridge Phase activity components.

TABLE 3: EVALUATION INDICATORS AND OUTCOMES MEASURES

COCOA FARM REHABILITATION OUTCOMES INDICATED BY*	TENURE DOCUMENTATION OUTCOMES INDICATED BY	LUP OUTCOMES INDICATED BY (HH OR COMMUNITY-LEVEL)
• Cocoa productivity & revenue (-) • Cocoa farm carbon stock, measured as aboveground cocoa and shade tree components (Mg/ha)* (-) • Other crop productivity & revenue (+)	• Perceived tenure security (scale) (+) • Ongoing or recent land dispute (Y/N) (-) • Possession of land documentation recognizing use rights (Y/N) (+) • Farm investments (inputs, tree-planting) (+)	• Perceived legitimacy & participation village-wide planning (+) • Perceived inclusive decision-making (+) • Perceived motivations for household land use decisions

• Area of new land cleared for farming (self-reported) (-) • Area of fallow land (acres, self-reported) (+)	• Credit Access (Y/N) and Amount (cedis) (+) • Crop productivity & revenue (+) • Area of new land cleared for farming (acres, self-reported) (-) • Area of fallow land (acres, self-reported) (+)Cocoa farm rehabilitation round 2 uptake (Y/N) (+)	• Mean fallow time (+) (self-reported; community-wide) • Mean area of secondary forest clearing (-) (self-reported; community-wide) • (at EL): Total area of secondary forest loss 2018-2020 (RS-derived LCLUC)

* Note that because the first cocoa harvest on rehabilitated cocoa farms is not expected to occur until late 2023, several years after the Bridge Phase evaluation endline data collection, outcomes for rehabilitated cocoa farms and farmers at the evaluation endline will be interim measures of intervention effects. Change during the Bridge Phase evaluation time frame is expected to be negative, due to the loss of cocoa trees and associated revenue during the Bridge Phase timeframe.

QUALITATIVE DATA COLLECTION AND ANALYSES METHODS

OVERVIEW OF QUALITATIVE APPROACH

This section describes the proposed methods for the qualitative component of this evaluation. The main source of qualitative data for the evaluation will be collected from household members in Bridge Phase communities, through group discussions (GDs) and key informant interviews (KIIs). Additional key informant interviews will be conducted with other project stakeholders, including implementing partner activity staff.

GDs and KIIs will be conducted in a total of eight communities: each of the four Bridge Phase implementation communities, and four of the eight non-Bridge Phase comparison group communities. To ensure qualitative data coverage from a sufficient number of farm rehabilitation service farmers, these four communities will be randomly selected from the pool of comparison group villages that has at least five farm rehab farmers. At baseline, qualitative data collection will be limited to one mixed-gender GD and a set of KIIs in the four comparison group communities, with no qualitative data collection by the evaluation in the Bridge Phase communities at baseline. This is to avoid duplication of effort and respondent fatigue for the IPs planned Participatory Rural Appraisal (PRA) activity that will take place in each of the Bridge Phase communities shortly after evaluation baseline data collection. As part of this streamlining across the evaluation team and IP qualitative data collection at baseline, the evaluation team will work with IPs as they develop their PRA approach and ensure that the IPs planned PRA activity will include coverage on all issues of interest for the evaluation.

At endline, the qualitative data collection in the Bridge Phase and sampled comparison group villages will be expanded to consist of two gender-segregated GDs with cocoa farmers per village, together with group KIIs held with: (1) farmers who received the ECOM farm rehabilitation service; and (2) farmers who did not complete or chose not to participate in the tenure documentation process. Qualitative data collection with these two target groups is proposed as group KIIs (up to five individuals) instead of GDs because the number of individuals per village in each of these groups is anticipated to be small. The endline configuration for GDs and KIIs will be revisited and finalized during endline planning in 2021, taking into account what works best with project implementation details.

The qualitative component for the evaluation will be structured to complement and expand on the quantitative results, particularly by generating plausible explanations of reasons for observed outcomes, the role and importance of different Bridge Phase activities, and reasons for any variations observed across the different sub-groups of interest (e.g., poorest households; women cocoa farmers vs men cocoa farmers; abunu leaseholders vs others). The qualitative data collection will also seek to identify any unintended broader consequences (positive or negative) of the Bridge Phase activities in implementation villages, beyond program objectives. It will therefore include a focus on understanding activity implementation processes and approaches, exploring the plausible reasons for adoption of promoted practices, and challenges and reasons associated with non-adoption or low uptake of program activities and practices.

The qualitative findings will be integrated with the quantitative statistical results, such that the qualitative data will provide an understanding of how and why individuals and households have changed their behavior and whether and how it relates to Bridge Phase activities; for example, with respect to technology uptake, agricultural investment, and land-use decision-making behavior. The qualitative data collection will be structured to enable gender-disaggregated analyses and examination of differential impacts by gender, activity participation and other sub-groups of interest for the evaluation. As for the quantitative data collection, qualitative data collection tools will be tested in the field prior to use.

It is envisioned that the same set of core protocols and tools will be used for both rounds of evaluation data collection, with some modifications made to protocols, respondent categories, or questions as may be needed at endline. This may include modifications that may be required given any major implementation changes that may take place during the Bridge Phase but were not envisioned at baseline.

OVERVIEW OF QUALITATIVE SAMPLE

Group Discussions

GDs will examine program effects on individuals and institutions and obtain depth of understanding around reasons for impacts and their variation across different sub-groups of interest. Table 4 provides a detailed description of target respondent categories for the GDs. At baseline, a total of four GDs will be conducted. At endline, the evaluation team anticipates conducting a total of 16 GDs. Each GD is expected to consist of 8 to 12 individuals. Discussions will be conducted by a moderator from the evaluation team, in the local language predominantly spoken in the implementation area (Twi), and utilizing semi-structured instruments with specific questions to guide the discussion. The evaluation team will ensure that GD instruments are designed to address the evaluation questions and elicit participant experiences on the key issues that are relevant for this evaluation.

TABLE 4: GROUP DISCUSSION SAMPLE AT BASELINE AND ENDLINE

GD PROTOCOL CATEGORY	BRIDGE PHASE COMMUNITIES				COMPARISON GROUP COMMUNITIES*			
	1	2	3	4	1	2	3	4
BASELINE: 4 GDs CONDUCTED Cocoa farmers (1 mixed-gender group per village)	0	0	0	0	1	1	1	1
ENDLINE: 16 GDs CONDUCTED Cocoa farmers (2 gender-segregated groups per village)	2	2	2	2	2	2	2	2

* Comparison group communities have some farmers who received the rehabilitation services. These communities did not receive the Bridge Phase tenure documentation or land use planning interventions.

GDs will be organized with the assistance of each sampled community (and Bridge Phase liaisons, where necessary). The evaluation will employ a within-group homogenous sampling strategy for the GDs, and will aim to convene respondents who represent a typical case for their category rather than an extreme case (i.e., not a respondent who was an outlier in terms of success or failure, but one who represents an average case). The GDs will be conducted in Twi and translated and transcribed to English for analysis.

Key Informant Interviews

KIIs will consist of semi-structured questions administered to Bridge Phase beneficiaries, other village-level stakeholders, (implementing partner) activity staff, and participating local authorities. The number of KIIs conducted at baseline is targeted at four, with potential adjustments or additions made at endline and as more information on the LUP component of the Bridge Phase becomes available. The interviews will follow a semi-structured format, and will allow for follow-up questions and flexibility in the evolution of the discussion. The KII guides will be structured to cover all key themes of relevance to answer the EQs, as appropriate to the respondent type. The KII guides prepared for each respondent type may also be updated by the evaluation team to accommodate additional respondent groups or to improve issue coverage. Table 5 indicates the overall baseline and endline sample description for the KII component of this evaluation.

TABLE 5: KII SAMPLE AT BASELINE AND ENDLINE

KII TARGET	NUMBER OF KII PER COMMUNITY	BASELINE DATA COLLECTION	ENDLINE DATA COLLECTION
Community Leaders: Chiefs and Elders (Group KII)	Baseline: 1 per community x 4 comparison group communities = 4 Endline: 1 per community x 8 communities = 8	✓	✓
Farm rehabilitation service farmers	1 per community x 8 communities = 8		✓
Farmers who did not complete or chose not to participate in tenure documentation service	1 per community x 8 communities = 8		✓
ECOM Field extension agent	1 per community x 8 communities = 8		✓
ECOM Supervisors	2		✓
Meridia Field Staff & Supervisors	2		✓
Winrock and TT Implementing Staff	4		✓
Asankrangwa Stool Secretary	1		✓

** Note that KII sample will be updated at endline as needed, to reflect new or additional information needs.

QUALITATIVE DATA ANALYSIS

The evaluation team will analyze transcribed data from the group discussions and KIIs using content analysis techniques, in which text will be coded according to key themes of interest across the interviewees and discussion participants. The team will summarize responses related to each theme and include quotations from respondents to illustrate key findings. This will include highlighting "outlier" responses and experiences, such that the range of responses will be captured in the summary write-up.

The team will conduct qualitative data analysis on GD transcripts using Nvivo, Dedoose or a similar program. Qualitative data will be analyzed within respondent categories and types (e.g., female cocoa farmers) and then across strata and types (e.g., female cocoa farmers vs. male cocoa farmers) to develop a thorough understanding of responses, address contradictory findings, and highlight common themes and narratives. The evaluation team will code all interview notes and transcripts with a two-pronged approach using the analysis software. Open coding will capture themes and broader trends as they emerge during an initial review of the data and will be grounded in the text of the coded documents (as opposed to being set ex ante). The team will further refine its analysis approach through follow-up coding that will assess themes between codes and may apply a hierarchical approach wherein codes are grouped and sub-grouped by evaluation question or topic area.

The team will triangulate coded segments and undertake analysis of findings to inform conclusions and recommendations. The evaluation team will also identify and use the main themes that emerge from the qualitative data to systematically augment the results drawn from statistical analyses of the household survey datasets. Where applicable, these will be supported with key quotations and examples from the group discussions and in-depth interviews. Lastly, the team will undertake systematic analysis of the qualitative data to understand whether and how differences are related to key context, farmer, or activity factors.

To the extent possible, the qualitative analyses will explain reasons for observed statistical results; enable the use of stories, anecdotes, and other qualitative information to demonstrate reasons and contributing factors for anticipated and unanticipated outcomes alike; and draw on individual stories to provide illustrative examples and elaborate on, for example, typical and outlier effects or differences across sub-groups of interest, and why such differences occur.

At endline, the qualitative findings will be integrated with the pre-post or quasi-experimental quantitative statistical results, such that the qualitative results provide a deeper understanding of the quantitative results, how and why individuals and households have changed their land use behavior and experienced livelihoods changes during the Bridge Phase, and how this relates to Bridge Phase activities (for example, with respect to technology uptake, agricultural investment, and land-use decision-making behavior).

USE OF SECONDARY DATA

The evaluation team will conduct an ongoing desk review of available Bridge Phase documents as they become available, and undertake content analysis of all available data relevant to the evaluation that is obtainable from IPs and available outside sources. This document review will permit the evaluation team to better understand how evaluation data collection can be refined to be consistent with implementation activities and better fill knowledge gaps, and may also provide a key resource for interpreting some of the evaluation results.

The evaluation team aims to draw on the following types of IP documentation for the evaluation, as provided by USAID or the Bridge Phase implementing partners:

- Bridge Phase Implementation Plan
- Bridge Phase Monitoring Reports
- Bridge Phase Quarterly and Annual Reports
- Partner reports and M&E data, as available

As the evaluation design and baseline data collection will be completed in a relatively short timeframe, the evaluation team expects secondary data collection to be an ongoing process. These sources will provide data and context about Bridge Phase implementation activities, local developments in the Asankrangwa area, and other issues that may affect data collection or the final analysis for the evaluation. To the greatest extent possible, relevant findings from this document review will be integrated into the primary data collection process and/or analyses, for example for refining the data collection instruments, revising KII respondent list, or to help interpret results.

QUANTITATIVE DATA COLLECTION AND ANALYSES METHODS

OVERVIEW OF QUANTITATIVE DATA SAMPLE AND APPROACH

The household sample for the quantitative survey component is envisioned to consist of 960 households surveyed across 12 villages, with equal allocation of 80 households per village. The 12 villages include: the four Bridge Phase communities (Domeabra, Suresu Nkwanta, Yirase, and Nyame Nnae), and eight additional communities in Asankrangwa where ECOM offered the farm rehabilitation service. Because only selection into the cocoa farm rehabilitation services will be known at baseline, the baseline sample aims to maximize the number of households surveyed per implementation village within the evaluation budget constraints, since the number of farmers who may take up the farm tenure documentation service will not be known at baseline[19]. The 80 household sample per village will include all farmers who were registered into the farm rehabilitation service by ECOM (this number ranges from 2 to 12 farmers per village, according to ECOM documentation), any farmers in the village who expressed initial interest in the service but did not make the eligibility cut[20], and the remainder of surveyed households to be selected via stratified random sampling.

The household sample at endline will replicate the same sampling design used at baseline, revisiting the same villages sampled at baseline. In the event of household non-response or inability to locate, households will be replaced with another from a replacement list that the survey team will draw up during the household listing conducted as part of the data collection. The baseline sample takes into account potential non-response at endline[21]. Revisiting the same households at endline will result in a panel dataset across time. This increases the precision of the outcome estimates and the ability to detect statistically significant program effects if they exist, by controlling for household-level factors in the statistical models that also likely influence outcomes, but are unrelated to the activity.

The quantitative analyses at endline will entail statistical analyses on two rounds of survey data, to document how various outcome variables have changed over time. Descriptive statistical analyses will be augmented with econometric analyses to identify how various factors, including the different Bridge Phase activity sub-components, affected the observed outcomes (controlling for observable covariates that typically also affect a given outcome variable of interest, such as: farmer gender, age, education, tenancy status, farm size, and farm age).

To test for differences in outcomes for farm rehabilitation farmers relative to others, the evaluation team will aim to exploit ECOM's use of specific selection criteria to identify farmers who are eligible for the service, listed below. The criteria contain a mix of farm site criteria that are primarily external to

[19] IPs estimate that approximately 340 farmers will select into this service per community, and anticipate a majority of farmers will take up the service.

[20] The evaluation team anticipates this information will be available from ECOM for each of the sampled villages, prior to the start of baseline data collection.

[21] Tests for attrition bias will be conducted at endline to understand whether households that attrited out of the sample did so at random, and appropriate analytic steps will be taken to ensure that results are not biased due to selective household attrition from the sample. If attrition tends to happen at random and does not strongly affect study power, this is less concerning for the final analyses. On the other hand, if there is indication that households that attrited out of the sample follow a systematic pattern (for example, household non-response was systematically higher for poorer households, or households that tended to be more tenure insecure at baseline), the loss of such households from the final analysis could bias the results. In addition, the evaluation team will take additional steps during enumerator training and data collection to avoid household nonresponse to the extent possible, including proper household listing and location/identification steps and making multiple attempts to visit households.

and outside the control of farmers, together with farmer characteristics. This presents the opportunity to use a regression discontinuity approach to examine farm rehabilitation outcomes during the Bridge Phase, since it will be possible to score non-selected farmers on these same criteria during the household baseline survey. Under this approach, selected and non-selected farmers alike in the household sample will be scored on the eligibility criteria, resulting in a quantifiable score distribution that relates to treatment. Scores for the selected farmers should be clustered at the higher end of the scale. Non-selected farmers are expected to have scores across the distribution of potential values, with an available pool of farmers who score close to but do fully meet all of the selection criteria (and were not selected for the rehabilitation service). Such farmers, if sufficient in number, present a viable comparison group to examine rehabilitation service outcomes.

Selection Criteria for Farm Rehabilitation Services:

- Farm site slope < 3 percent
- Farm soil type is sandy loam
- Farm site cannot be mangrove, swampy, or water-logged
- Farm site should not be in the middle of a forest, and at least 30m away from any natural reserves
- Farms should be over 25 years old with a focus on highly unproductive farms (i.e. farms producing below 200 kg/ha)
- Farmers should be prepared to cut cocoa for complete rehabilitation and be willing to pay off investment with proceeds from the farm
- Farmer has the right to cut and replant cocoa farm
- Farmers with land documentation or have signed up for Meridia's service[22]
- Farmers should have gone through at least one year of ECOM training
- Farmers endorsed by purchasing clerks, franchise holders and field officers
- Farmers with multiple farms shall be considered as an added advantage

A rigorous testing of effect of tenure documentation is more challenging under the Bridge Phase implementation structure. All households in the Bridge Phase villages will have their land mapped and be eligible to receive the tenure document, but most of them will be required to pay a fee to obtain the document (a small number, not yet determined at time of draft EDR, may receive a cost subsidy). Prior work by the implementing partner in Ghana has demonstrated high demand for the service, but low ability to pay the document fee. As a result, the evaluation must overcome an anticipated strong selection bias for treated farmers, as farmers who self-select into this service are expected to likely differ from the general population in several ways (for example, they may be wealthier, have larger landholdings, or more or less tenure secure than the population as a whole). The proposed 960 household sample for this evaluation is anticipated to render it possible to construct a viable comparison group to assess the effects of this component, drawing from farmers in the eight non-Bridge Phase villages in the household sample. These are farmers who were not offered and did not receive the tenure document, but are expected to be similar to those who did on key farm, farmer and household characteristics. In the event that such a comparison group cannot be meaningfully constructed, a pre-post analysis of change on anticipated tenure security outcomes based only on farmers surveyed within the Bridge Phase village sample is anticipated to yield biased results.

[22] Evaluation team communications with ECOM indicated this selection criteria was downgraded for this initial offering to "farmer interest in obtaining land document". ECOM due diligence on the selection criteria in March 2019 indicated that most of the eligible farmers did not yet have land documentation, and the Meridia service was not explicitly included in the service package description that ECOM provided for the initial offering.

HOUSEHOLD SURVEY

The household survey will be developed by the evaluation team drawing on existing relevant survey instruments and taking into account best practice survey design. In doing so, the evaluation team will draw on existing survey instruments for cocoa landscapes and rural households in Ghana, including the EGC-ISSER Socioeconomic Panel Survey[23], the Ghana Living Standards Survey[24], the Cocoa Research Institute of Ghana farmer socio-economic survey of 2016 and the 2016 Royal Tropical Institute (KIT) cocoa sector household survey[25].

The survey is anticipated to comprise farm plot, individual and household-level modules, including coverage on issues listed below (to be further updated and refined during instruments design):

- Household Identification and Consent
- Household Roster and Individual Member Characteristics (include employment and education, migration)
- Household Assets
    - Assets: Livestock, tools, durable goods
    - Financial assets: Borrowing, lending, savings
- Agricultural Production
    - Total landholding, allocation across cocoa, food crops, forest/fallow, area of new farm clearing
    - Agricultural product sales and storage: crop revenues and storage
    - Plot roster data, including:
        - Plot background information: size, fallowing, soil and irrigation information, investment, ownership, decision-making and rental status, crops, agro-inputs, labor inputs
        - Mode of land acquisition (purchase, inheritance, allocation from traditional authority, gift, borrows, rents in; sharecrops; long-term lease)
        - Year of land acquisition
        - Year of cocoa establishment (where applicable)
        - Year of last fallow
        - Tree planting activity
        - Distance to plot (walking time, in mins) from household
        - Plot has boundary markings (Y/N)
        - Perceived tenure security of plot
- Cocoa Farm Rehabilitation
- Forest Resource Use and Governance
- General Land Use Information, Decisions, Tenure Security
    - Land tenure security, disputes, documentation, payments and willingness to pay, land use decision-making
- Non-farm activities
- Food security and subjective well-being
- Housing characteristics

QUANTITATIVE DATA ANALYSIS

The quantitative analyses at endline will entail statistical analyses on two rounds of survey data, to

[23] https://egcenter.economics.yale.edu/egc-isser-ghana-panel-survey
[24] http://microdata.worldbank.org
[25] https://www.kit.nl/project/demystifying-cocoa-sector/

document how various outcomes variables have changed over time. Descriptive statistical analyses will be augmented with econometric analyses to identify how various factors, including the different Bridge Phase activity sub-components, affected the observed outcomes (also controlling for observable covariates that typically affect a given outcome variable of interest). The broad analytic approach is outlined here, and will be further refined through a post-baseline pre-analysis plan when associated parameters for the intended analyses will be known.

Under a quasi-experimental impact evaluation design, project impacts are determined by drawing on outcome information collected from a group of project beneficiaries (the treatment group, or in this case, farmers that received farm rehabilitation services; farmers that received a land tenure document), and the same set of information collected from a group of comparable households and individuals that did not receive the treatment (known as the comparison group). The comparison group serves as the counterfactual for the treatment group, providing information on what would have happened to households and individuals in the treatment group, had they not received the project intervention. For the impact analysis to be credible and robust, households in the comparison group should be as similar as possible to those in the treatment group across key characteristics that also influence the outcomes of interest under the project. Examples of such characteristics include household factors such as the household's poverty status prior to the start of project activities, cocoa farm size or the maximum level of education in the household. All of these characteristics conceivably could influence the likelihood of household or individual interest or ability to participate in intervention activities, as well as the extent to which project activities may bring about the desired changes in outcomes for the household. Village context factors are also important, though somewhat less so for household-level interventions being considered for this evaluation.

For the farm rehabilitation intervention, the evaluation team aims to use a regression discontinuity (RD) approach to estimate the intervention's effect on outcomes of interest. The RD approach is particularly useful when there is a known and quantifiable assignment into treatment, as is the case here, although the approach is less powerful than a randomized experiment. In addition, average treatment effects are localized to the sample that scores close to (is most similar to) the treatment group. The workhorse model for RD analyses takes the form of an Analysis of Covariance (ANCOVA) model:

$$Y_i = \beta_0 + \beta_1 Z_i + \beta_2(\chi_i - \chi_c) + \varepsilon_i \qquad (1)$$

In this formula, Y_i is the value of the outcome for individual I; Z is the treatment dummy variable and takes a value of 1 for rehabilitation farmers (otherwise 0); χ is the assignment variable and χ_c is the cut-off score which determines treatment; β_1 provides the treatment effect estimate. ε_i is an error term.

For the tenure documentation intervention, the evaluation team will aim to use a difference-in-difference (DID) regression approach, coupled with statistical matching, to estimate the intervention's effect on the selected outcomes of interest. Under the DID approach, an estimate of the program's impact on each outcome indicator is obtained from the average difference in outcomes between matched treated and comparison group households, across the baseline and endline survey rounds. The evaluation team combines the DID design with statistical matching to further reduce sources of bias and improve the precision of the impact estimate. Several different matching approaches are available and will be considered by the evaluation team, including propensity score matching, entropy balancing[26] and genetic matching[27]. Per best practices, analysts will select the matching approach that yields the strongest comparability across the treatment and

[26] Hainmueller, J. 2012. Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis* 21(1):25-46.
[27] Diamond, A. and J.S. Sekhon. 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.

comparison group units for the data in hand (i.e., balance across treatment and comparison group households on key baseline characteristics).

The DID model includes a range of covariates to control for observed differences in the treatment and control groups, as well as fixed or random effects that can control for time-invariant unobserved factors. The treatment effect is estimated by a regression coefficient on a dummy variable that interacts time and treatment.

The DID model takes the following generic form:

$$Y_{ist} = \alpha + \gamma_s(\text{Treatment}_s) + \lambda(\text{time dummy}_t) + \delta D_{st} + \epsilon_{ist} \qquad (2)$$

In this formula, i is individual, s is treatment and t is time. Y_{ist} is the value of the outcome for individual i, in treatment s and at time t. γ_s is the effect of treatment at baseline. Treatment is 1 for program beneficiaries and 0 for comparison households. λ is the effect of time dummy. Time dummy is 0 for baseline, 1 for endline. D_{st} is a dummy variable defined by interaction of treatment and time. δ is the DID estimate of the treatment, the effect the evaluation is interested in. Under standard assumptions, δ provides an unbiased average treatment effect estimate of the causal impact of the intervention on the outcome Y. ϵ_{ist} is an error term. The workhorse model will include a household-fixed effect term to absorb time-invariant household-level characteristics that may influence outcomes. Models will be run on the most optimally matched sample obtained via the selected statistical matching.

DATA QUALITY ASSURANCE

SURVEY PRE-TEST AND TRANSLATION

All survey instruments, including informed consent scripts, will be prepared in English and Twi and translated to the appropriate local languages prior to data collection. Instruments will be translated using experienced translators and back-checked by another individual.

Household survey data collection for the evaluation will use computer-assisted personal interviewing (CAPI) rather than paper surveys to minimize data entry errors and improve real-time quality control. The survey instrument will be programmed in-house at NORC, using CSPro or NORC's Nfield platform. As part of the programming process, NORC will conduct regular survey pre-tests and use the test results to refine the language and flow of the survey instrument. The survey will be initially programmed in English to allow NORC staff to test the survey flow and logic. Simultaneously, NORC's local data collection partner will translate the survey instrument to Twi. NORC will then incorporate the local language translations into the programmed survey and pre-test the final translated survey before the beginning of enumerator training. The baseline survey instrument will be pre-tested among 20 households in a village setting near Asankrangwa town that is similar in context to implementation villages, to ensure comprehensibility and appropriateness. Any necessary changes to the final survey instrument will be made by the local survey firm, in consultation with the evaluation team.

ENUMERATOR TRAINING

Under the supervision of the evaluation team, the data collection firm will recruit enumerators and plan logistics for enumerator training and data collection. Members of the evaluation team will lead the enumerator training in English, together with the selected survey firm staff. The training will include seven days of classroom training, two days of pilot testing and one day for a debrief from the pilot test. The classroom training will include an in-depth review of the questionnaire in English and Twi. The NORC team will present enumerator best practices and lead role-playing exercises to ensure that enumerators are adequately prepared for data collection in the field. The training and the pilot testing will also reveal any remaining issues with the instrument translation or the survey programing, which will be addressed prior to the beginning of fieldwork. Following the training and any required survey and/or programming updates, enumerator teams will start data collection following the evaluation team's quality control procedures.

Prior to the start of the baseline training and data collection, the evaluation team will also develop the training manuals that will be used for household survey training and fielding purposes. The training manuals will provide guidance to supervisors and field staff on the household survey protocol and procedures. The supervisor's manual will describe the study design and objectives, supervisor roles and responsibilities, rules and regulations, ethics, fieldwork preparations and quality control requirements and procedures. The interviewer's manual will include guidelines for implementation of the survey and fieldwork procedures, including interviewing techniques and procedures for completing the questionnaires.

QUALITY CONTROL

NORC implements rigorous quality control measures in all of its evaluation work, starting from enumerator training and continuing through data collection in the field, processing and analysis to ensure the validity and reliability of results and delivery of documented datasets. During survey fielding, the evaluation team employs close oversight of data collection teams, including high-frequency validation and reliability checks, daily data uploads during quantitative data collection and weekly production reports. The evaluation team will also regularly review the survey data for quality and provide necessary feedback to the local data collection firm during survey fielding. Lastly, a local coordinator member of the evaluation team will provide in-country oversight, accompanying enumerators during interviews at regular intervals and provide an additional backstop for overall quality and enumerator comprehension and conduct of survey implementation during survey fielding.

Additional quality measures will be taken during the data processing stage, after the evaluation team receives the final household survey dataset from the local data collection firm. Such measures include range checks on numeric and text responses; checks on variable labels, structure, unique identifiers and skip patterns; data cleaning to detect and correct incomplete or inconsistent data and format errors; investigation of outliers and missingness; and assessment of weights construction.

Quality control measures for the qualitative data collection effort also include quality oversight across all steps in the process, from data collection to transcribing to digital format, cleaning and coding and documentation and delivery of qualitative datasets as required.

EVALUATION STRENGTHS, LIMITATIONS, AND POTENTIAL BIAS

The design for this performance evaluation contains some design limitations and sources of bias that are relevant to note. However, the availability of two rounds of panel survey data and two rounds of substantive qualitative data for the endline analyses are strengths that will help to mitigate some of the potential limitations inherent in this type of a performance evaluation design.

STRENGTHS

- Pre-post design with potential for quasi-experimental analyses: The proposed household survey sample may enable quasi-experimental analyses of outcomes for the two farmer-level components of the Bridge Phase activity. At minimum, baseline-endline comparison will allow the evaluation team to measure relative change over the course of Bridge Phase implementation.

- Mixed-methods study: The use of robust qualitative data collection at baseline and endline will enable stronger understanding of relationships between intervention processes and beneficiary outcomes, and help to interpret statistical findings.

LIMITATIONS

- Low power for assessment of farm rehabilitation effects: The small treatment sample size for the farm rehabilitation intervention introduces constraints on study power (see Annex III). As a result, the analyses for this component are powered to detect only relatively large effect sizes, although this is also in line with expected magnitude of effects for several outcomes. Companion qualitative data collection for this evaluation aims to: help corroborate the statistical results; capture information on potential confounders; and understand beneficiary perceptions on if and how project activities helped to elicit change in key outcomes.

- Fairly small scope of implementation will likely limit the external validity of findings: The Bridge Phase activities will be implemented in four communities that have been purposively selected and show variation on key context issues, such as current scarcity of secondary forest and the level of contention in the community regarding renegotiation of *abunu* tenancy arrangements.

POTENTIAL SOURCES OF BIAS FOR QUALITATIVE RESULTS

- Response bias: The evaluation team will select KII and GD participants through purposive, homogenous sampling. This will help to ensure that the team obtains data from the most relevant sources available. Of those respondents who are available, there may be bias in the types of responses they give because of an expectation that the evaluation team is looking for a certain type of answer. To mitigate this kind of biased response, the evaluation team will rigorously test its discussion templates and interview instruments and protocols to ensure that there are no leading questions, that the purpose of the evaluation is clear, that respondents are not primed with information that could skew their responses, and that respondents feel comfortable speaking truthfully. Coding all responses and post-interview analysis will help identify responses that may have been biased or where the measurement process was skewed in some way.

- Recall bias: The baseline / endline approach for this evaluation will provide a robust comparison case for assessing Bridge Phase activities. Although the timeframe for Bridge Phase activities and the evaluation is fairly short, it is still possible that some topics related to the evaluation, such as perceptions about specific actors or recollection of processes, will be difficult to accurately remember as time passes. Recall bias may lead to exaggerated negative or positive perceptions of past experiences, as people tend to remember only key aspects or feelings over time. Follow-up interviews, a well-crafted KII instrument, appropriate follow-up questions, and the use of secondary data will help the evaluation team mitigate some of the challenges of recall bias.

- Selection bias: This evaluation will rely on qualitative data based on perceptions and recall using data collected over a short time period. It is likely that not all of the key informants and GD participants identified will be available or willing to respond to the evaluation team. Those who are willing to share their views may not be representative of Bridge Phase participants overall. The sampling approach applied in this evaluation will aim to select respondents with various experiences and roles, but the data will still be subject to the willingness of people to respond. The evaluation team will work to find a balanced group of respondents, who may still share the same views, to minimize selection bias. However, the non-random design of this evaluation will not be able to completely avoid this challenge.

DATA MANAGEMENT PLAN

DATA STORAGE AND BACKUP

Digital household survey data at endline will be collected and transmitted via Nfield CAPI, a cloud-based data collection app that runs on Microsoft Azure. Data collected through the Nfield app is stored in the secure Azure cloud, which the Microsoft Global Foundation Services manages. Within the Azure cloud, NORC's data files are kept in a unique domain, which can be thought of as a physical insulated entity that has no relationship with any other domain. This ensures that only NORC has access to its data stored in the cloud. NORC can download data from the cloud at any time through encrypted Secure Sockets Layer (SSL) connections. During survey fielding, NORC will regularly download the data from the secure server and store it on NORC servers, which are also regularly backed up. All additional data collected for this evaluation will also be stored in a digital repository on NORC servers, regularly backed up and will be accessible only to members of the evaluation team. All data collected at the field level will be managed by the evaluation team and overseen by the CEL/NORC team.

DATA FORMAT AND SHARING

The evaluation data and information will be converted to the appropriate formats and shared with USAID per ADS 579 requirements and guidelines. To ensure transparency and replicability, all data will be submitted as annotated datasets clearly defined with codebooks and annotated analysis of files.

Structured quantitative and qualitative data will be stored in a non-proprietary, machine readable (.csv) format. Metadata will be generated in the form of codebooks and data summaries. Unstructured qualitative data, such as interview transcripts, will be stored in text-based data entry templates. The final, anonymized dataset will be compiled and submitted to the Land and Urban Office within the E3 Bureau, as well as the USAID Development Data Library (DDL) in accordance with ADS 508 and ADS 579.

At baseline and endline, the evaluation team will deliver final data files and documentation to USAID following the completion of the data analysis and finalization of the baseline or final evaluation report. Datasets and documentation to be delivered will include:

- Raw and cleaned versions of the baseline and endline survey database;
- Codebook for each dataset submitted;
- Data cleaning and analysis do files;
- Final analytic dataset, including and all derived indicator variables, in Stata format and .csv format — these will be anonymized to protect individual confidentiality for use as a public dataset in USAID's Development Data Library (DDL)

PRIVACY AND CONFIDENTIALITY CONSIDERATIONS

Informed Consent

The evaluation team will obtain informed consent from respondents before carrying out any data collection in households. A consent form will be used that will be translated into the appropriate local language, Twi. Scripts for interacting with participating households, survey instruments, focus group scripts and all other data collection materials are subject to ethical approval from NORC's Institutional Review Board (IRB) before use. Careful attention will be paid to ensure that respondents understand that their responses will be used for research purposes and are expected to be made public without compromising their confidentiality and anonymity. The evaluation team will safeguard the confidentiality and anonymity of all household survey, FGD and KII respondents.

Ethical Approvals

The evaluation team will strive to maintain high standards in methods, quality, and data security. The evaluation team will obtain required ethical approvals for the endline evaluation data collection through NORC's internal IRB to ensure the protection of human research subjects. The evaluation team will also obtain any in-country approvals required by the Government of Ghana. All data collection activities will adhere to the professional standards of the American Evaluation Association and all data will be handled in such a manner as to protect the identities of informants in any situations where their comments could potentially have a negative impact on their employment or security. The evaluation team will safeguard the confidentiality and anonymity of GD and KII respondents. In all cases, and specifically where data are collected from individuals not acting in their professional capacity as representatives of an organization, the evaluation team will obtain informed consent.

BASELINE WORK PLAN AND TIMELINE

This section provides an overview of the baseline data collection, analyses and reporting activity timeline. An overall timeline for all evaluation tasks is included as Table 6.

EVALUATION FIELD WORK SCHEDULE

The evaluation team completed a scoping trip in November 2018, during which the Team Leader and a local consultant undertook group discussions and site visits to better understand the Bridge Phase implementation context and refine the evaluation design. Baseline data collection is expected to begin in May 2019, timed to ensure that the baseline takes place before the implementation of land tenure documentation sensitization activities within Bridge Phase communities. Endline data collection is anticipated for mid-2021, to enable sufficient time for endline data collection, analyses and reporting to inform USAID and IP decisions on scaling, anticipated for late 2021 (see Figure 2).

ESTIMATED TIMELINE FOR BASELINE ACTIVITIES

Table 6: Timeline of Baseline Evaluation Activities

	CEL Project Year 1 (Sept 2018–May 2019)									PY 2 (2019)		
	S	O	N	D	J	F	M	A	M	J	J	A
Phase I: Scoping and Evaluation Design												
SOW / WA development and finalization												
Desk review of IP documents, survey dataset exploration and analyses, scoping trip site selection, instruments development												
Ghana scoping trip												
Develop draft EDR (draft EDR submitted: 21 December, 2018)												
Deliverable 1: Scoping report												
Deliverable 2: Draft Evaluation Design Report												
Phase II: BL Data Collection, Analyses and Reporting												
Deliverable 3: Final Evaluation Design Report (submission of final EDR o/a 14 days after receipt of consolidated comments by USAID and any external reviewers on 2nd draft EDR) (**Target:** April 19, 2019)												
Data collection firm solicitation & contracting												
Draft qualitative and quantitative instruments and sampling protocols												
Deliverable 4: Final qualitative and quantitative instruments												
Instruments translation and IRB preparation												
Survey programming												
Preparation of enumerator training materials												
Enumerator training - HH survey + pilot test (**Target:** May 13-18)												
Enumerator training - Qualitative + Pilot test (**Target:** May 13-18)												
Quantitative HH survey data collection (**Target:** May 20 – June 5)												
Qualitative data collection (**Target:** May 20 - 25)												
Deliverable 5: Weekly production reports during data collection (May 28, June 4, June 11)												
Quantitative data cleaning & analyses												
Qualitative data transcription (by firm)												
Qualitative data coding and analyses												
Deliverable 6: Data cleaning plan & final training materials (**Target:** June 25, 2019)												
Preliminary Results synthesis & discussion with AID (**Target:** July 24, 2019)												
Follow-up analyses and report writing												
Dataset preparation												
Year 2 Deliverable: Draft baseline report (**Target:** TBD)												
Year 2 Deliverable: Baseline presentation (**Target:** TBD)												
Year 2 Deliverable: Final baseline report (o/a 20 days after receipt of all comments)												
Year 2 Deliverable: Submit quantitative datasets												

BASELINE DELIVERABLES AND REPORTING

DELIVERABLES

The remaining deliverables[28] that will be prepared for the baseline phase of this evaluation are listed in Table 7 below.

Table 7: Evaluation Baseline Deliverables List and Target Dates

	Deliverable	Estimated Due Date	Target Date
3	Final Evaluation Design Report	o/a 14 days after receipt of USAID and any external comments on 2nd draft of EDR	April 19[29], 2019
4	Final quantitative household survey instrument(s)	o/a 20 days prior to launch of baseline	April 29, 2019
5	Final qualitative instruments and protocols	o/a 10 days prior to launch of baseline	May 10, 2019
6	Weekly production reports during survey fielding	weekly, during data collection	May 28, June 4, & June 11, 2019
7	Data quality and cleaning plan; Final enumerator training materials	o/a 20 days after completion of baseline data collection	June 25, 2019
8	Draft baseline report	o/a 60 days after completion of baseline data collection	TBD
9	Baseline results presentation	o/a 10 days after submission of draft Baseline Report	TBD
10	Final baseline report and 2-page abstract	o/a 20 days after receipt of USAID comments on draft baseline report	TBD
11	Cleaned HH survey datasets	o/a 20 days after approval of final baseline report	TBD

REPORTING AND DISSEMINATION

Reporting

The baseline (endline) report is expected to be less than 75 pages, excluding references and annexes, and will include an executive summary, introduction, Activity background, the EQs and methodology, evaluation limitations, baseline (or endline) findings, conclusions, and recommendations, and lessons learned (as applicable). The executive summary will be up to eight pages in length and summarize the evaluation purpose, project background, EQs and methodology, and the key baseline (endline) findings, conclusions, and recommendations, and lessons learned (as applicable). The report will aim communicate key results to a non-technical audience, but will also provide sufficient details on methods

[28] The first two deliverables were the scoping trip report (finalized in January 2019) and draft EDR (submitted to USAID in December 2018).

[29] The target submission date for the final EDR takes into account that USAID plans for external review of an interim draft of the EDR which will be submitted to USAID after finalization of the Bridge Phase Implementation Plan by Implementers, and pending receipt of implementation details required by the evaluation team to finalize the proposed evaluation design.

and results to meet technical standards for rigorous mixed methods performance evaluation reporting.

Dissemination

To disseminate knowledge gained from this evaluation, the evaluation team will make oral presentations to specified audiences, such as USAID, Winrock and other IPs, and other donors. All documents and reports will be provided electronically to USAID. The evaluation report will follow USAID guidelines set forth in the agency's Evaluation Report Template30 and How-To Note on Preparing Evaluation Reports31 as well as the Mandatory Reference for Automated Directives System 201 on USAID Evaluation Report Requirements.

In accordance with AIDAR 752.7005, CEL will also make the final evaluation report publicly available through the Development Experience Clearinghouse (DEC) within 30 days of receiving approval from the Contracting Officer's Representative.

CORE EVALUATION TEAM COMPOSITION

The core team for this evaluation will consist of a Team Leader with substantial land tenure, rural livelihoods and natural resource governance evaluation experience, supported by an evaluation coordinator, quantitative data specialists and a qualitative research specialist. Support will be provided as needed by approved junior staff to ensure successful, on-time completion of deliverables. The core team members for the evaluation are listed below.

TEAM LEADER AND EVALUATION SPECIALIST – DR. LAUREN PERSHA

Dr. Persha is a land tenure, evaluation, and livelihoods specialist with more than a decade of experience designing and leading mixed qualitative and quantitative research and providing technical evaluation expertise across land tenure; smallholder agriculture and rural livelihoods; local institutions; governance; and natural resource management sectors. She has led multiple impact or mixed methods performance evaluations of multi-sectoral development projects, most of which integrate large-scale household survey data with qualitative data.

Dr. Persha holds a PhD in Environmental Science from Indiana University. Currently a Senior Research Scientist at NORC at the University of Chicago, she was an Assistant Professor in the Geography Department at the University of North Carolina at Chapel Hill from 2011-2016. Prior to her academic experience, she spent five years in development project implementation with a UNDP-Global Environment Facility alternative livelihoods and forest conservation project in East Africa. Her research has been published in journals such as *Conservation Biology*, *Forest Policy and Economics*, *Global Environmental Change*, and *Science*, and in 3ie's Impact Evaluation Report series. For this evaluation, she will be responsible for overall quality of evaluation design and execution, including planning, implementing, and documenting the baseline and final evaluation results. This is not a full-time position.

SENIOR DATA SPECIALIST – DR. ALI PROTIK

Dr. Ali Protik is an economist specializing in the design and impact analysis of experimental and quasi-experimental evaluations and constructing survey instruments. Dr. Protik has 20 years of relevant statistics and methodology experience, including study design and sampling methodologies for quasi-experimental impact evaluations and advanced statistical analysis of experimental and quasi-experimental

[30] See http://usaidlearninglab.org/library/evaluation-report-template
[31] See http://usaidlearninglab.org/library/how-note-preparing-evaluation-reports

data. He is currently a Senior Research Scientist at NORC at the University of Chicago and has previously worked at Mathematica Policy Research for 11 years and at the Center for Health and Population Research in Bangladesh. He is a former Hewlett Foundation/Population Reference Bureau dissertation fellow in population economics and holds a Ph.D. in Economics from Brown University. His research has been published in journals such as *World Development*, *Education Finance and Policy*, and *Food and Nutrition Bulletin*. For this evaluation Dr. Protik will provide ad-hoc support in the design and execution of the evaluation sampling strategy and statistical analyses. This is not a full-time position.

MID-LEVEL EVALUATION SPECIALIST AND EVALUATION COORDINATOR – MR. RON WENDT

Mr. Ron Wendt is a Principal Research Analyst with NORC at the University of Chicago with more than 5 years of research experience. He has previously worked as the Research Manager for Innovations for Poverty Action in Rwanda, an evaluation consultant for Educate, a Project Associate for Innovations for Poverty Action in Kenya, and a Volunteer Consultant for TechnoServe in Ethiopia and the United States. Mr. Wendt is a graduate of Columbia University's School of International and Public Affairs has been published in *The Lancet Global Health* and *Tropical Medicine & International Health*.

For this evaluation, Mr. Wendt will serve as the overall Evaluation Coordinator for the NORC team, and will provide day-to-day management of the evaluation's local data collection partner and oversee all aspects of quantitative data collection. He will also support development of the data collection tools, lead CAPI-based survey-programming, co-lead quantitative survey training for enumerators and supervise the launch of data collection activities. This is not a full-time position.

MID-LEVEL DATA SPECIALIST – MR. GREGORY HAUGAN

Gregory Haugan is a Principal Research Analyst for NORC at the University of Chicago. Mr. Haugan conducts data quality reviews, data cleaning, and provides advanced statistical analysis and data visualization on education, rural development, and governance projects. Mr. Haugan has eight years of related work experience and holds a Masters in Economics from Universidad de Los Andes in Colombia. Previously, he was a Research Fellow at the Inter-American Development Bank.

For this evaluation he will contribute to household survey design and testing, lead all data quality reviews, oversee all aspects of data processing, management and quality review; provide data cleaning, analyses and visualization of quantitative survey data, and contribute to baseline and final evaluation report writing. This is not a full-time position.

MID-LEVEL RESEARCH SPECIALIST – MS. ZOE GROTOPHORST

Ms. Zoe Grotophorst is a Principal Research Analyst with NORC at the University of Chicago and a qualitative research specialist. She has seven years of experience designing qualitative data collection instruments; conducting key informant interviews and group discussions; leading qualitative data cleaning and analysis; and contributing to evaluation report writing. She holds a Master of Public Policy (MPP) from George Mason University. For this evaluation, she will contribute to qualitative instruments design, provide oversight of qualitative team training and data collection activities, lead the coding and analyses of qualitative data from focus group discussions and key informant interviews, including analyses of group-to-group variation and synthesis of content analysis across focus groups, and contribute to baseline and final evaluation report writing. This is not a full-time position.

USAID PARTICIPATION

Regular communication between the evaluation team and the designated USAID Activity Manager for this evaluation will be essential to the successful execution of the evaluation activities. The evaluation team will keep USAID apprised of changes and developments that necessitate/require any significant decision-making or modification of the approved Evaluation Design Report.

ESTIMATED COST AND LOE

[Estimated LOE and budget provided separately to USAID.]

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ANNEX I: OVERVIEW OF RELEVANT THEORY AND EMPIRICAL LITERATURE

The Bridge Phase activities and TOC relate to at least four broad sets of literature highlighted below. A summary of relevant theory and findings from recent empirical studies is presented below, drawing particularly on studies from Ghana and Western region where available, and the cocoa sector specifically.

LAND TENURE[32], TENURE STRENGTHENING AND LINKS TO AGRICULTURAL AND FOREST LAND USE

Customary Tenure, Cocoa and Tenure Security in Ghana

As for many countries in sub-Saharan Africa, Ghana has a pluralistic legal system with respect to land. The law recognizes parallel customary and statutory tenure systems, with overlapping jurisdictions across traditional and government authorities. In practice, approximately 80% of land in Ghana is governed under customary tenure arrangements, which can take a number of different forms (Pande and Udry 2005). In many areas of Ghana, including the country's cocoa frontier landscapes, family acquisition of land under customary arrangements follows a similar pattern of occupation of uncultivated land by a settling family, and subsequent allocation to relatives, extended families, and/or new migrants to the area (Lambrecht and Asare 2016). Farmers typically distinguish between stool[33] land (under custody of the chief) and family land (land that is usually sub-divided among nuclear households or specific family members). Chiefs traditionally do not have authority to make land allocation or use decisions over family land, but may be involved in settlement of land disputes. Stool land traditionally was used to benefit the community as a whole, but such areas may be declining in the face of changing land use norms. For example, in a study of seven cocoa-farming communities, Lambrecht and Asare (2016) note prior conversion of all communal land to families, and highlight a privatizing trend[34] toward land rights in traditional customary systems in the country overall, linked to increased population pressure and market forces.

Some studies suggest that land rights contention between landowners and cocoa tenant farmers, coupled with increasingly scarce availability of new land, has imposed severe constraints on cocoa farmer's livelihoods, including their ability to channel farm revenues into expanding their agricultural landholdings. In a study from Western region, Knudsen and Fold (2011) noted that farmers with larger landholdings (typically landowners and indigenous families) may be better positioned to take advantage of economic opportunities on-farm or to diversify into non-farm activities, such as wage labor, manufacturing or services. They may also be better positioned to engage in higher value chain activities for food crops that in turn could contribute to a cycle of higher earnings (study examples included: trade in food productions, sale of agro-chemicals and/or building materials, engaging in transport provision). They also suggest that total cocoa farm holdings has potential linkages to farmer ability to access formalized sources of credit, as farmers in their study with larger cocoa farms were also more likely to use electronic payment services that are typically required to access formal loans from rural banks.

[32] Land tenure is defined as: "the full set of institutions and policies that determine how the land and its resources are accessed, who can hold and use these resources, for how long, and under what conditions" (Naughton-Treves and Wendland 2013, Bruce et al 2010).

[33] A stool is a community governance or administrative structure in Ghana, similar to dynasties (Owubah et al 2001).

[34] Conceptualized by the authors as obtaining stronger and more exclusive rights to the land, including decisions-making that does not need to obtain consent or consult other family members or with traditional authorities (Lambrecht and Asare 2016).

Tenure Security and Agricultural Investment

Empirical studies of linkages between improved tenure security and agricultural productivity and other outcomes are highly developed, and draw on long-standing economic theory regarding the role of property rights in rural agricultural livelihoods[35]. Studies from Ghana comprise a notable body of this literature, including at least seven fairly seminal papers that examine the relationship between land tenure security or various tenurial arrangements, agricultural investment and productivity[36]. As for the body of literature as a whole, the methods, indicators and findings vary somewhat across studies within the Ghanaian context, but generally point to evidence for a link between stronger tenure security and increased agricultural investment effects. The evidence from Ghana for a subsequent increase in agricultural productivity due to tenure security gains is less conclusive (Lambrecht and Asare 2016), as is also seen for the empirical base as a whole. While there continues to be mixed evidence for this link, it remains a key and compelling component of the broader theoretical framework by which stronger tenure security is hypothesized to lead to improved livelihoods outcomes in development contexts. Scholars have long pointed to inconsistent tenure security and outcome definitions, measurements and approaches across studies as a key reason for the still inconclusive body of evidence with respect to the tenure security-agricultural productivity link (Place, 2009; Arnot et al., 2011; Ghebru and Lambrecht 2017). Using mode of land acquisition or ownership/tenancy status as proxy measures of tenure security Quisumbing et al. (2001) and Abdulai et al. (2011) both find that more secure tenure is linked to greater agricultural investments (tree planting) and agricultural productivity.

In a more recent contribution, Ghebru and Lambrecht (2017) used nationally representative data to examine factors associated with perceived tenure security by farmers in Ghana. In line with a large body of previous literature, their findings reinforce that mode of land acquisition and farmer demographic characteristics are important determinants, as well as important village-level context factors. In their study, perceived tenure security was higher for land obtained through inheritance. Migrant farmers and women in female-headed households expressed lower perceived tenure security over their farms. At the village level, tenure security was found to be lower in villages with higher economic activity (proxied by proportion of households in the community with modern roofing) and active land markets (proxied by higher level of land purchase, renting, or sharecropping in the community)[37].

The focus on tenure security effects on land fallowing and the length of fallow time has received substantial attention in Ghana, as well as its concomitant effects on agricultural productivity. In many contexts, farmers' perceived tenure security over fallow land has been shown to be lower than for actively farmed or managed plots, though the risk of outright loss of the land is often mediated by the farmer's social status as well as the specific dynamics of land pressures and scarcity in the locality (Goldstein and Udry 2008; Ghebru and Lambrecht 2017).

Forest fallows are a long-standing component of traditional farming systems in Ghana, where they are valued by small-scale farmers for NTFPs, provisioning of soil fertility restoration and related ecosystem services, and others such as economic benefits that may be derived timber and NTFPs (Aanglaare et al. 2011). Farmer perceived tenure security over their landholdings thus has direct links to efforts to retain and expand secondary forests in such areas. Shorter fallow times are also linked to lower soil fertility restoration (Goldstein and Udry 2008, Otsuka et al 2003). Several studies have suggested that decreased

[35] The key role of well-defined and secure land tenure rights for a functional, efficient and equitable REDD+ program is also now well-recognized (Sikor et al 2010; Sunderlin et al 2009).

[36] For example see: Migot-Adholla et al 1994; Place and Hazell 1993; Besley 1995; Goldstein and Udry 2008; Quisumbing et al 2001; Otsuka et al 2003; and Abdulai et al 2011.

[37] The authors did not propose an explanation for this association in their study sample, but noted their interest in this relationship draws from broader concerns in the literature that land markets could erode farmers' perceived tenure security for a variety of reasons, including elite capture, reduced equitable access to land, or an increase in land conflict linked to monetized land values.

fallow times due to increased land use pressures is altering the nature of the fallow-agricultural mosaic in cocoa landscapes in Ghana. This likely has implications for a reduced role of fallows in biodiversity conservation and associated carbon storage interests unless landscape-scale management practices can find effective ways to maintain these shifting agricultural-fallow mosaics in the landscape (Anglaare et al. 2011). Among others, key factors that challenge the ability to maintain fallow land in a landscape include market access, population density and resource use demands, all of which typically exert increased pressure to keep land under continuous productive use.

Tenure Security and Forest Use

The literature with respect to interactions among indigenous tenure systems and sustainable forest systems is also voluminous, but more heterogeneous than that of tenure and agricultural productivity, and often based on small-scale case studies and site-specific understandings. Land tenure insecurity is viewed as a key underlying driver of deforestation in sub-Saharan Africa, although there are few empirical studies of its particular role in deforestation dynamics in Ghana. A notable exception is Damnyag et al. (2012), who examine the interplay of land tenure arrangements, local rules and off-reserve deforestation across several communities in Ghana. Their findings suggest that some of the informal rules on farming practices and land use decisions commonly found in Ghanaian customary tenure systems do create perverse incentives for farmers that contribute to forest cover loss within communities. For example, informal rules on farming practices and whether farmers can plant or retain use rights to trees under some tenure arrangements were seen as promoting intensive cultivation and shortening fallow periods, thus reducing secondary forest cover, and discouraging tree-planting and the maintenance of remnant forest trees on farms. Farmers engaging in sharecropping or leaseholds were more likely to practice intensive cultivation and have shorter fallow times, relative to land obtained through inheritance.

In Ghana, the situation is further complicated by the separation of land tenure and tree tenure rights, as is common throughout many parts of sub-Saharan Africa (Paavola et al. 2008). Under prevailing laws, naturally occurring trees outside of gazetted Forest Reserves are property of the state, not the holder of the land on which the tree grows (Damnyang et al. 2012). As such, farmers are faced with a complicated incentive structure with respect to land use decisions, in which there is little benefit to farmers maintaining naturally occurring trees on their land and the planting of new trees on-farm may also expose them to additional livelihood risks.

More generally, there is a robust literature that has examined links between form of land tenure, tenure security and deforestation dynamics. In perhaps the most comprehensive meta-analysis to date, Robinson et al. (2014) find that stronger land tenure rights are associated with lower deforestation, irrespective of the form of land tenure. However, their work also underscores broader literature, which tends to highlight that the relationship between tenure security and forest outcomes is strongly dependent on local context and underlying assumptions, and often hinges strongly on factors such as local agricultural forest product prices, labor costs, degree of access to forests, long-distance trade dynamics, and local socio-economic conditions (Kaimowitz and Angelsen 1998).

AGRICULTURAL INTENSIFICATION AS A MEANS TO REDUCE LAND PRESSURE AND MAINTAIN FORESTS

Sustainable Intensification and Links to Deforestation

A related area of research aims to better understand the extent to which agricultural intensification efforts increase agricultural incomes, reduces pressure for new land clearing, and reduces poverty. Current research on agricultural intensification as a means to reduce land pressure and maintain forests has yet to reach consensus, but has made significant strides in exposing and disentangling the complex pathways and potential outcomes that may result from intensification efforts, noting these are not always positive with respect to forest conservation objectives. Recent work examining the linkages between agricultural intensification and desires to reduce deforestation highlight that the underlying driver of intensification efforts is an important determinant of expected deforestation trajectories.

Scholars distinguish between technology-driven[38] intensification and market-driven[39] intensification (Byerlee et al. 2014; Lambin 2012). At global scales, studies find that technology-driven intensification generally has a net benefit on reduced deforestation through land sparing measures, although there are counter examples of case-specific local studies where technical advances spur additional land clearing. Localized context here matters – including proximity to forest frontiers and the nature of the commodity market. Market-driven intensification, in contrast, typically drives additional deforestation and agricultural land expansion, even at global scales, and particularly for export commodities experiencing a boom (high price on global market) (Angelsen and Kaimowitz 2001). Recent work highlights the strong importance of intensification type, and also emphasizes that even where agricultural intensification efforts are successful at reducing pressures to clear new land for farming, such processes alone are typically not sufficient to slow deforestation without a corresponding improvement in the effectiveness of efforts to govern natural resource use and management (Byerlee et al. 2014).

Intensification is seen to increase profits for farmers, and their returns to the land, which in turn can incentivize farmers to expand their land area to continue taking advantage of increase profit opportunities. But, market dynamics can mediate this process. At the local level, there is a body of evidence that finds technology advances can and generally does reduce cropland expansion and deforestation (Villoria et al. 2014; Byerlee et al. 2014). There are multiple complex potential pathways and mechanisms by which technology-driven intensification can lead to reduced pressure to clear new land for agriculture, hence reduce deforestation. Some of the key hypothesized pathways are through a range of potential market effects, such as reduced market prices that lowers production costs per unit output and reduces farmer incentive to expand their area of production; and labor market effects whereby technological progress attracts labor to more efficient or intensive cultivation areas and away from forest frontiers (Byerlee et al. 2014). But, there are also examples where such processes have led to increased land clearing and deforestation, in which the combination of higher yields and increasing land rents drove new forest-frontier clearing. Crops produced for world markets, as is the case for cocoa, require careful consideration, because international trade dynamics (including market prices and policy responses) can swamp local dynamics.

Where intensification efforts are driven by market processes, there is stronger evidence of increased expansion of agricultural land use and deleterious effects on forest conservation efforts (DeFries et al. 2013; Meyfroidt et al. 2013). Here, key pathways include increased land profitability of agriculture over other land uses, leading to increased production pressure that stimulates additional land clearing in land-abundant areas, such as on forest margins (Villoria et al. 2014). Typically, new market opportunities and concomitant increased land pressure are also facilitated by increasingly integrated global commodity markets and trade processes, increased economic growth in countries such as China, Brazil and Indonesia, and rapid urbanization in these and other historically poorer countries (Byerlee et al. 2014).

Overall, Byerlee et al. (2014) caution that the notion that improvements in sustainable intensification will

[38] Technology-driven intensification: "Technological change to the crop allows more output of the crop per unit land area, *for the same level of inputs.* E.g., new crop varieties, improved crop or resource management, improved crop protection." (Byerlee et al 2014).
[39] Market-driven intensification: "A shift to higher value crops due to new market opportunities, or a shift in input mix in response to relative price changes, such as substituting fertilizer for land in response to rising land prices" (Byerlee et al 2014). This can also be an increase in real commodity prices relative to non-agricultural prices.

lead to win-win outcomes for agricultural production and natural resource conservation is still based more on theoretical reasoning than a strong body of empirical evidence. Barriers to achieving this, which are strongly evidenced in the literature, include insecure tenure rights, absent or weak local institutions, and high opportunity costs for farmers to change their current agricultural practices. They particularly highlight the situation that in many ways has parallels to the Bridge Phase context: "in situations of poor forest governance and ready availability of new land, farmers on the forest frontier have few incentives to intensify". They highlight that new policy prescriptions or interventions must be targeted to the right context, particularly for areas in the tropics on forest margins (globally, roughly 80% of agricultural expansion in the tropics is from primary or secondary forest clearing (Gibbs et al. 2010), and Ghana is strongly in line with this pattern). Among those interventions highlighted as most critical is working out effective (and coupled) land and forest governance policies.

ENVIRONMENTAL GOVERNANCE AND SOCIAL AND ECOLOGICAL WINS

Effective governance[40] is widely recognized as essential for achieving environmental conservation goals, regardless of context. Assessing or improving environmental governance requires looking at institutions, structures, and procedures. Assessing governance performance entails attention to at least four elements that are broadly conceptualized to comprise a good governance system: effectiveness, equity, responsiveness and robustness. Measurement of governance systems can take many forms. In the context of environment governance, such assessments typically include a focus on participation, perceived legitimacy, inclusive decision-making, resource outcomes (for example: resource provisioning, productivity, area), socio-economic outcomes (for example: income, subsistence needs, wellbeing), and attention to equitable distribution of resources.

Environmental governance can be defined as "the establishment, reaffirmation or change of institutions to resolve conflicts of interest over environmental resources" (Adger et al. 2003; Paavola 2007). The empirical literature is rife with examples of customary common-pool resource arrangements that have developed through collective action and essentially take the form of self-governance over environmental resources by customary resource users, often with little involvement by an overarching state government (for example, see: Ostrom 1990; Baland and Platteau 1996; Ostrom 2000; Dietz, Ostrom and Stern 2003). This body of work has, among many other seminal contributions, highlighted the importance of several community attributes for the likelihood of achieving effective resource governance outcomes (for example: the number of different people involved in resource use, the level of heterogeneity of their preferences, the amount of social capital in the system and/or among actors (Agrawal 2001; Ostrom 2009).

Effective contemporary environmental governance solutions are assumed to be inherently complex[41], because the resources systems of interest typically involve many different agents (resources users) who typically hold a variety of different entitlements to the resource (Paavola et al. 2007). These are commonly conceptualized as different "bundles of rights". As is often the case in customary land settings, the distinction between private and common property is often unclear (Paavola 2007), and different resources within the system may function either as private goods or common-pool

[40] Governance is defined as "the institutions, structures, and processes that determine who makes decisions, how and for whom decisions are made, whether, how and what actions are taken and by whom and to what effect" (Graham et al 2003, Lockwood et al 2010, Bennett and Sattersfield 2018). Governance is distinct from management, which encompasses the resources, plans and actions that result from functional governance. Institutions are the formal (laws, policies, tenure systems) and informal (social norms, prevailing power structures) rules that shape human interactions and that guide or constrain actions (North 1990). Structures are the formalized arrangements or bodies that produce rules and make decisions. Processes are the means by which governance functions are undertaken, such as policy formulation, conflict resolution, and information dissemination.

[41] As will likely be required for maintaining secondary forests in the Bridge Phase implementation area.

resources[42].

Appropriate environmental governance solutions in such cases typically require development or affirmation of a complex system of rights across a variety of different types of resource users (Paavola 2007). Paavola (2007) highlight that complex governance systems typically involve overlapping institutions (even at local levels), in which new (or existing) layers of collective ownership or institutions can help to re-affirm and secure benefit streams of the resource to a diverse range of users (beyond just the private landholder and nominal "owner" of the resource). The institutional design of such a system will generally require attention to the functional and structural elements of the system and how they are organized with respect to each other – these are the operational, collective-choice and institutional sets of rules (the hierarchy or tiers of the different elements, so to speak); the governance functions (with respect to excluding people, regulating resource use and distribution of any benefits, resource provisioning, monitoring and enforcement, conflict resolution and collective choice issues (related to how decisions are made in general with respect to governing the system); and how institutional rules are formed within the system. In general, governance solutions seeks to create systems of checks and balances in order to distribute power among different vested interests, create transparency and accountability, and foster democratic discussion and processes related to using and managing environmental resources (Paavola 2007).

Research on collaborative governance more generally highlights the importance of prior cooperation (or conflict), participation incentives, power and resource disparities, leadership and institutional structure as key shapers of success. Trust, face-to-face dialogue, and shared understandings of process and objectives are also key (Ansell and Gash 2007).

Integrated Governance, Land Use Planning and Forest Conservation

A very large body of literature has aimed to identify key governance factors associated with reduced degradation of common-pool resources, including mediating deforestation in customary or communal land settings. Early research focused on individual case studies, but recent work has increasingly turned to more systematic meta-analyses across larger numbers of cases. Such studies commonly point to the importance of external recognition of customary rights, and the presence, monitoring and enforcement of resources rules (For example, see: Hayes 2006; Gibson et al. 2005; Pagdee et al. 2006; Porter-Bolland et al. 2011; Persha et al. 2011). A crucial issue, however, is getting the incentives right to promote the desired land use and reduce the attractiveness of less desirable alternatives. Prevailing scholarly views on this have increasingly focused on providing sufficient payments, subsidies or other incentives (Payments for Ecosystem Services type approaches) that aim to better take into account the opportunity cost to livelihoods incurred to farmers through forgoing conversion of forest land to typically more lucrative crops (at least in the short term).

In general, the expectation that improved governance will lead to reduced deforestation is long-standing in the literature (Geist and Lambin 2002; Mendelsohn 1994). Many national REDD+ strategies also highlight that addressing natural resource governance issues is a central need for successfully reducing emissions from deforestation (Wehkamp et al. 2018). However, in practice scholars use a wide range of conceptual frameworks to define "good governance", while study context differences and inconsistent methodological approaches contribute to remaining uncertainty as to how such goals can effectively be achieved in practice. Baker et al. (2018) report on governance results from a set of natural resource management interventions in Ghana, and highlight several implications of their findings with respect to designing effective natural resource governance regimes in the country. They particularly point to tensions related to unsustainable land use, intensive agricultural development and population growth, and note that improved governance is constrained by, among others, low implementation capacity,

[42] As also appears to be the case for secondary forests in Bridge Phase communities.

tensions between customary and state institutions, and ambiguous resource tenure and management responsibility.

COCOA FARMING LANDSCAPES, CARBON SEQUESTRATION AND GOVERNING FOREST-COCOA TRANSITIONS IN GHANA

Cocoa Landscapes and Carbon Sequestration

Despite cocoa's domination as Ghana's primary export crop, overall cocoa production is low at approximately 350 kg/ha, and well below potential yields of 1-2 tonnes/ha that are obtained on research farms (Dawoe et al. 2014). Expansion of cocoa production, rather than productivity gains, account for the bulk of Ghana's increase in national output in recent years, while Western region is considered to be to the "last frontier" of cocoa expansion (Dawoe et al. 2014).

Coca expansion is widely documented as the primary driver of deforestation in Ghana. For example, in a study from Western Region, Benefoh et al. (2018) found that conversion to cocoa farming accounted for 54.7% of total forest loss in their study area during 1986-2015, and an average annual deforestation rate of 3% over the same period. The area under cocoa plantations expanded by 23% during the same time period. Contributing to the knowledge base on nature, extent and magnitude of land use change associated with cocoa expansion in Ghana, they identified dominant patterns of land use transitions from a study area in Western Region through remote sensing analsyes of land cover and land use change. Over 1986-2015, they found that cocoa farm expansion in their study area was primarily from open forest and lands in transitions, while closed forest[43] conversion directly to cocoa farms was localized, uncommon, and associated with earlier waves of cocoa frontier expansion in the area. Some conversion of cocoa back to open forest also occurred over the study timeframe, primarily through abandonment of cocoa farms with declining productivity that were left to revert to fallow land. But, additional clearing of open forests and lands in transitions for new cocoa expansion resulted in no net change in this land use category in the study area.

The expansion of the cocoa sector in Ghana is strongly linked to deforestation, not just through outright conversion of primary forests to cocoa farms, but also including forest and tree cover loss resulting from on-farm intensification activities that have led to declining shade tree density together with complete removal of shade trees in cocoa farming systems in the country (Mohammed et al. 2016). The establishment or expansion of agroforestry cocoa systems is seen as a promising option to increase carbon sinks and mitigate deforestation in the country, as evidenced by the inclusion of the cocoa sector in Ghana's national carbon emission accounting budgets (Mohammed et al. 2016). But, current understanding of optimal agroforestry stand structure, species and planting arrangements to maximize carbon sequestration and other intended benefits appears to rest on a small number of studies to date with considerable learning still to be had (Konsager et al. 2013).

There are a small and growing number of existing studies that have measured changes in carbon and nutrient stocks under various aged cocoa systems, under varying shade management strategies, and in comparison to secondary forest-fallow systems, natural forests or selectively logged forests that account for the bulk of land use transitions to cocoa farm establishment (Mohammed et al. 2016; Dawoe et al. 2014). Mohammed et al. (2016) found that the above-ground carbon contribution (as well as the below-ground contribution) to total carbon varied significantly across different cocoa agroforestry systems (shaded vs unshaded), and also by region.

[43] In the cited study, closed forest was primarily in state protected reserves but off-reserve forests are also included in this land use category. The authors note that off-reserve closed forest was mainly relic intact forest still existing in communities because they are sacred groves or cemeteries. Most of the remaining closed forest in the study area was within forest reserve boundaries.

Cocoa agroforests (establishing shade trees in cocoa farms) are widely promoted, but knowledge gaps remain about their overall farm-scale benefits, especially with respect to soil carbon, carbon sequestration, soil fertility, and effects of shade trees on cocoa tree growth and yields (Blaser et al. 2017). Blaser et al. (2017) found that cocoa yields decreased significantly with increasing shade tree canopy cover in one study from Ghana. A number of studies have generated evidence that shade tree inclusion on cocoa farms can lead to lower cocoa growth and short-term yields (Wade et al. 2010; Blaser et al. 2017). In a study from Eastern region, Wade et al. (2010) found that cocoa yields were negatively correlated with shade levels on farms, and that higher yields were associated with high management intensity. They also found that plots with higher yields had lower carbon storage, corresponding to a trade-off between cocoa intensification and carbon storage. Traditional cocoa farms had higher carbon storage than intensively farmed cocoa, but they also had significantly lower cocoa yields (38% of yield obtained from intensively farmed cocoa). Studies also find that over the longer term, yields in unshaded cocoa systems can eventually see dramatic declines due to increased disease, loss of soil fertility, and other ecological factors associated with unshaded systems (Clough 2009).

Shade trees are noted to also have other benefits that are net improvements for the system and/or farmer livelihoods, such as climate buffering, pathogen regulation, improved pollination services, erosion control, nutrient cycling and soil fertility enhancement, biodiversity enhancements, and providing farmers with additional income streams and/or livelihood benefits (e.g. from timber or fruit production via the shade trees) (Andres et al. 2016). A number of naturally-occuring shade tree species have been found to be preferred by farmers in cocoa landscapes in Ghana, for a combination of their timber, fruit, medicinal and other NTFP values, soil fertility and related properties (Aanglaare et al. 2011).

Ultimately, some studies suggest that sustainable intensification of cocoa production through improved management practices on existing cocoa farms, and slowing or stopping additional conversion of natural forest to cocoa, is likely a stronger mitigation alternative at the landscape scale than the incorporation of shade trees into the cocoa farm system (Blaser et al. 2017).

With respect to carbon sequestration and accounting, there are a number of empirical studies from Western Region and other areas of Ghana that have used plot-based destructive or non-destructive field sampling methods to measure carbon stocks and system biomass from unshaded and varying shaded cocoa systems (referred to as cocoa agroforestry systems)[44,45]. Borden et al. (2017) note that given the average cocoa farm size in Ghana of around 2 hectares, the gains in biomass carbon stocks at that fairly small scale will primarily by due to the addition of large shade trees.

Mohammed et al. (2016) estimated total above-ground carbon stock and ecosystem biomass from cocoa farms in Ghana's Eastern and Western regions, as the sum of the biomass carbon from cocoa trees, shade trees, stumps and litter. They estimated total ecosystem carbon stocks in shaded and unshaded cocoa systems in Ghana's Western region at 137.8 ± 8.6 Mg C/ha (Mohammed et al. 2016), and found that approximately 89% of the systems' Carbon stock was stored in soils. The common shade tree species they identified on the cocoa farms were: *Terminalia ivorensis, Terminalia superba, Entandrophragma cylindricum, Entandrophragma angolense, Newbouldia laevis, Persea americana, Celtis mildbraedii, Cola nitida, Carica papaya, Palmae sp., Spondia smombin, Ficus exasperate, Citrus sinensis* (L.) Osbeck, *Acacia mangium*, and other forest tree species. Avocado (*Persea americana*) was the dominant shade tree in cocoa farms

[44] For example, see: Blaser et al 2017; Borden et al 2017; Mohammed et al 2016; Konsager et al 2013; Dawoe et al 2014; and Wade et al 2010.

[45] Note these studies provide a useful foundation of published cocoa farm stand characteristics and carbon stock estimates, from farms of varying age and shade tree establishment that this evaluation can draw on for purposes of obtaining rough estimates on anticipated Carbon stock changes that may result from Bridge Phase cocoa farm rehabilitation and shade tree establishment activities.

from their study in Western region.

Total biomass carbon can be highly variable across different cocoa ecosystems. Mohammed et al. (2016) measured cocoa farms ranging from 7-28 years old across shaded and unshaded system. Their estimates ranged from 16.7 ± 2.2 Mg C/ha in unshaded systems in Western region to 31.3 ± 2.2 Mg C/ha in a shaded system in Eastern region. Shaded systems do have significantly higher carbon stocks than unshaded cocoa systems. The estimated aboveground carbon storage contribution from cocoa trees ranged from 11.8 – 16.9 Mg C/ha, and the shade tree component ranged from 10.2 – 16.4 Mg C/ha (Mohammed et al. 2016).

The Mohammed et al. (2016) study also provides insights into different carbon stock trajectories over time, across shaded and unshaded systems. For example, 10 year old farms in shaded and unshaded systems had similar above-ground biomass stocks, but total carbon stocks in the shaded systems increase at a higher rate as stand age increases. "While biomass carbon stock from shaded systems was twice that in unshaded systems, the two systems did not differ significantly with respect to total ecosystem carbon stocks. The bulk of the carbon stock was in the soil." (Mohammed et al. 2016).

Dawoe et al. (2014) estimated total tree biomass (cocoa and upper canopy trees) in shaded 3 year cocoa systems at 12.7 ± 1.6 Mg/ha, in 15 year cocoa systems at 135.0 ± 43.7 Mg/ha, and at 185.2 ± 27.3 Mg/ha for 30-year shaded cocoa systems. These estimates are in contrast to an estimated total tree biomass (trees > 10 cm DBH) in natural forests in the study area (selectively logged forest reserves) of 209.3 ± 33.3 Mg/ha (all results reported from areas in Ashanti Region). Konsager et al. (2013) assessed the aboveground carbon sequestration potential of cocoa in Ghana, estimated at 65 tC/ha, with an accumulation of 3.1 tC/ha/year. They note there is considerable carbon sequestration potential in cocoa farming systems if they are established on land that previously had "modest" carbon stocks, such as degraded forest or agricultural land. They note that in the tropics, tree crop plantations such as cocoa agroforestry systems can be an important carbon sink and component of achieving long-term reductions in atmospheric GHG levels. Thus, such an approach is a feasible mitigation strategy.

Cocoa Intensification, Forest Sustainability and Livelihoods

The focus on carbon sequestration benefits from agroforestry systems also ties into desires to more strongly link climate change mitigation and sustainable development objectives, which several scholars and practitioners consider essential for the achievement of either set of objectives. Konsager et al. (2013) note that because most of the remaining natural forest cover outside of protected forest reserves in Ghana has already been converted to plantations (primarily to meet cocoa expansion demands), the country has already transitioned to a context in which forest degradation and agroforests will constitute the main source of GHG emissions, rather than deforestation of natural forests (Kongsager et al. 2013). As the authors put it: "the window of opportunity for avoided deforestation projects in Ghana is closing quickly, and the focus now has to be directed to afforestation and reforestation projects" (Konsager et al. 2013). This also ties into considerations around land sharing (low-input agricultural extensification) versus land sparing (intensification) tradeoffs in the context of land use dynamics in Ghana's cocoa landscapes. Assuming that farmers who benefit from cocoa farm intensification efforts do not choose to invest income gains from such intensification into clearing new land to further expand their cocoa holdings, Wade et al. (2010) point out that a land sparing strategy[46] in theory leaves a much greater area of land potentially available to be retained or restored to forest. In their modelling, intensification would need only 38% of the land required from an extensification approach in order to achieve same cocoa yield and carbon storage.

Does such intensification efforts lead to knock-on positive improvements to farmers' livelihoods? Recent

[46] Such as is arguably being pursued through the Bridge Phase farm rehabilitation activity component.

work by Hirons et al. (2018) on the links between increased cocoa income and aspects of household poverty found that cocoa income was not associated with a significant increase in household access to basic needs such as electricity or water. They highlight that households with smaller landholdings generally benefit less from efforts to raise incomes through agricultural intensification efforts, relative to those with larger landholdings. Such households are also disproportionately "losers" from intensification initiatives that require minimum farm size to be eligible, which may be of note for Bridge Phase rehabilitation services that also contain a farm size-based eligibility criteria. In their study, this has some implications for distributional impacts of the program, which may inadvertently disproportionately benefit better-off households.

In the West African cocoa context, despite that the bulk of supply-chain sustainability initiatives are implemented in Ghana and Ivory Coast (Ingram et al. 2018), to date there are few existing studies in the published literature of sustainability initiative outcomes in the cocoa sector at the relevant farmer and farm-level scales and oriented around the set of issues highlighted by the Bridge Phase. An exception is Ingram et al. (2018), who examined social, economic and environmental effects of cocoa sustainability public-private-civil society partnerships in Ghana and Ivory Coast. Using a Difference-in-Difference (DID) quasi-experimental approach and 385 household sample in Ghana, they examined effects of a cocoa farm sustainability certification package of services that included training, agricultural inputs, credit (advance payments on cocoa or credit, depending on farmer) and UTZ certification itself[47]. In Ghana, they found no change in cocoa productivity, income, profit per hectare, total cocoa net income, or shade tree planting as a result of the certification package during the 2012-2015 BL to EL period. They did find a negative effect on production costs per hectare (costs were higher), but this was offset by an increase in the price of cocoa. The general trend in production costs was an increase over time, due to an increase in labor costs, but rising cocoa prices offset this to some extent.

The main reasons for a lack of effect of the certification package was that non-intervention farmers were also able to access similar inputs, services and trainings, and to benefit from a gain in cocoa productivity and associated income, hypothesized to stem from broader cocoa sector reforms affecting cocoa farmers in the country at the same time as this specific intervention. This includes state involvement in regulatory and other aspects of the cocoa value chain, including market and pricing reforms, licensing of buyers and exporters, providing farmers with new cocoa varieties, and providing forms of capacity building directly to farmers. In addition, farmers in the study area were able to access support from other donor or foundation-supported projects providing similar types of support as the UTZ certification package, such as through the World Cocoa Foundation. Another reason, obtained through qualitative data collection, was that the effects on cocoa productivity and incomes anticipated from access to farm inputs like improved seedling varieties, were not expected to occur until some years beyond the endline data collection for the study[48]. The study did find, however, that a higher level of participation in the package of certification services (intensity of services received, number of trainings participated in) was associated with increased cocoa productivity. Importantly, farmers noted that changes to income were highly affected by external factors as well, including weather, changing labor costs, and price reforms in the broader market that are outside their control. Their study results also highlight that farmer uncertainty stemming from land tenure, fluctuating cocoa prices and farm rehabilitation costs is a specific and key barrier to achieving improved cocoa productivity, farm household livelihood improvements, and greater sustainability in the value chain (Ingram et al. 2018).

[47] UTZ is a certification program and label for sustainable farming, and one of the common voluntary standards adopted by the cocoa and chocolate industries. For additional information, see: https://utz.org/what-we-offer/certification/products-we-certify/cocoa/

[48] As is also the case for the Bridge Phase implementation activities and timing of evaluation endline data collection for this evaluation.

ANNEX II: EVALUATION DESIGN MATRIX

Evaluation Question 1 : Tenure Documentation Effects on Tenure Security

Evaluation Question	Evaluation Sub-Question	Data Source(s)	Data Collection Methods / Instruments	Outcome Measures / Indicators	Data Analysis Methods
1. What are the effects of land tenure documentation on tenure security for cocoa farmers in Bridge Phase villages, and key reasons why?	a. What was the extent of parcel mapping and provisioning of land tenure documentation?	• Farmers in Bridge Phase villages and in comparison group villages • IPs & IP documentation (secondary data)	• Household survey • GDs • KIIs	• Likelihood of having any land mapped • Area of farms mapped (acres) • Likelihood of possessing land documentation	• Descriptive summary statistics • Difference in difference with statistical matching
	b. Were there any challenges encountered with respect to participation in tenure documentation activities, and how were these resolved?	• As above	• GDs • KIIs	• n/a	• Non-experimental pattern / content analysis of qualitative data
	c. How did Bridge Phase tenure documentation activities affect household perceptions of tenure security, and anticipated investment and livelihood follow-on outcomes?	• Farmers in Bridge Phase villages and in comparison group villages • IPs & IP documentation (secondary data)	• Household survey • GDs • KIIs	• Perceived tenure security (scale) • Ongoing or recent land dispute incidence • Farm investments (inputs, tree-planting) • Crop productivity (Kg/ha) & revenue (cedis) • Credit Access & Amount (cedis) • Food security (HDDS and HHS[49]) • Likelihood of fallowing & area (acres) • Likelihood of clearing new land for cocoa or other crops • Area of new land cleared (acres)	• Descriptive summary statistics • Difference in difference with statistical matching • Pre-post non-experimental pattern / content analysis of qualitative data
	d. Given that this activity was provided as fee-for-service, with individuals in the Bridge Phase communities self-selecting into this activity, what types of households and farmers were more likely to pay for and obtain farm-level documentation? For what types of farm holdings?	• Farmers in Bridge Phase villages • IPs & IP documentation (secondary data)	• Household survey • GDs • KIIs	• Likelihood of possessing land documentation • Documentation fee paid and timing of payment[50] *Factors:* • Farm size, farm age • Farmer age, gender, tenancy status, education • Household wealth status, total farm holdings	• Descriptive summary statistics • Difference in difference with statistical matching + heterogeneity analyses • Non-experimental pattern / content analysis of qualitative data

[49] HDDS = Household Dietary Diversity Score; HHS = Household Hunger Scale.
[50] To be finalized pending IP finalization of payment options and structure of payment schedule.

Evaluation Question 2 : Tenure Security and Farm Rehabilitation Linkages

Evaluation Question	Evaluation Sub-Question	Data Source(s)	Data Collection Methods / Instruments	Measure or Indicator	Data Analysis Methods
2. How does farmer tenure security relate to interest, uptake and outcomes of cocoa farm rehabilitation services?	a. Controlling for other household and farm-level factors, were farmers who received farm tenure documentation during the Bridge Phase more likely to participate in the second round of farm rehabilitation services offered at the end of the Bridge Phase?	• Farmers in Bridge Phase villages and in comparison group villages • IPs & IP documentation (secondary data)	• Household survey • GDs • KIIs	• Cocoa farm rehabilitation service round 2 uptake (Y/N, measured both as hypothetical and actual uptake if Round 2 is offered)	• Difference in difference with statistical matching
	b. How does tenure documentation increase interest in, and ease the ability for farmers to participate in farm rehabilitation services?	• As above	• Household survey • GDs • KIIs	• n/a	• Non-experimental pattern / content analysis of qualitative data
	c. What are the effects of higher tenure security on farm rehabilitation intermediate outcomes (farm investments, productivity, revenues, amount of new land clearing) at the end of the Bridge Phase?	• Farmers in Bridge Phase villages and in comparison group villages • IPs & IP documentation (secondary data)IPs & IP documentation (secondary data)	• Household survey • GDs • KIIs	• Perceived tenure security (scale) • Ongoing or recent land dispute incidence • Farm investments (inputs, tree-planting) • Crop productivity (Kg/ha) & revenue (cedis) • Credit Access & Amount (cedis) • Food security (HDDS and HHS[51]) • Likelihood of fallowing & area (acres) • Likelihood of clearing new land for cocoa or other crops • Area of new land cleared (acres)	• Descriptive summary statistics • Non-experimental pattern / content analysis of qualitative data

[51] HDDS = Household Dietary Diversity Score; HHS = Household Hunger Scale.

Evaluation Question 3 : Farm Rehabilitation Effects and Secondary Forest Clearing Linkages

Evaluation Question	Evaluation Sub-Question	Data Source(s)	Data Collection Methods / Instruments	Measure or Indicator	Data Analysis Methods
3. To what extent and in what ways does cocoa farm rehabilitation lead to reduced deforestation and greenhouse gas (GHG) emissions in secondary forests?	a. What is the effect of farm rehabilitation on cocoa farm carbon stocks, fallowing decisions, amount of secondary forest clearing and broader household land use decisions, for farmers engaged in farm rehabilitation during the Bridge Phase timeframe?	• Rehabilitation service farmers and rehab comparison group farmers[52] in Bridge Phase villages and in comparison group villages • IPs & IP documentation (secondary data)	• Household survey • Carbon stock measurements on farms • GDs • KIIs	• Likelihood of fallowing & area of fallow (acres) • Likelihood of clearing new land for cocoa or other crops • Area of new land cleared (acres) • Cocoa farm carbon stock (measured as aboveground cocoa and shade tree components in Mg/ha)	• Descriptive summary statistics • Regression discontinuity • Pre-post non-experimental pattern / content analysis of qualitative data
	b. What are reasons for any observed changes in land use decisions during the Bridge Phase?	• (as above)	• (as above)	• n/a (qualitative analyses)	• Pre-post non-experimental pattern / content analysis of qualitative data • Descriptive summary statistics of related survey data
	c. How did Bridge Phase Farm rehabilitation services affect household perceptions of tenure security, and intermediate outcomes for anticipated investment and livelihood effects at the end of the Bridge Phase?	• (as above)	• (as above)	• Perceived tenure security (scale) • Ongoing or recent land dispute incidence • Farm investments (inputs, tree-planting) • Cocoa productivity (Kg/ha) & revenue (cedis) • Other crop productivity (Kg/ha) & revenue (cedis) • Credit Access & Amount (cedis) • Food security (HDDS and HHS[53])	• Descriptive summary statistics • Regression discontinuity • Pre-post non-experimental pattern / content analysis of qualitative data

[52] The comparison group for rehabilitation service farmers is restricted to farmers in the total household sample who scored similarly to rehabilitation service farmers on ECOM's eligibility criteria, but did not receive the service.
[53] HDDS = Household Dietary Diversity Score; HHS = Household Hunger Scale.

Evaluation Question 4 : Land Use Planning and Secondary Forest Clearing Linkages

Evaluation Question	Evaluation Sub-Question	Data Source(s)	Data Collection Methods / Instruments	Measure or Indicator	Data Analysis Methods
4. To what extent and in what ways does spatially-based territorial land use planning (LUP) at multiple scales lead to reduced deforestation and greenhouse gas (GHG) emissions in secondary forests?	a. What is the effectiveness of the Eco Game as a tool to elicit land use planning behavior change and actions?	• Farmers in Bridge Phase villages and in comparison group villages • IPs & IP documentation (secondary data)	• Household survey • GDs • KIIs	• Perceived legitimacy & participation in village-wide LUP • Perceived inclusive decision-making • Perceived motivations for household land use decisions • Mean fallow time (self-reported; community-wide) • Mean area of secondary forest clearing (self-reported; community-wide) • (at EL): Total area of secondary forest loss 2018-2020 (RS-derived LCLUC)	• Pre-post non-experimental pattern / content analysis of qualitative data • Descriptive summary statistics of related survey data • Remote-sensing based Land Cover / Land Use Change (LCLUC) analyses (conducted at endline)
	b. If not as effective as anticipated, what alternative tools and approaches might future programs consider piloting?	• (as above)	• (as above)	• n/a (qualitative analyses)	• Non-experimental pattern / content analysis of qualitative data

Evaluation Question 5 : Influence of Context Characteristics

Evaluation Question	Evaluation Sub-Question	Data Source(s)	Data Collection Methods / Instruments	Measure or Indicator	Data Analysis Methods
5. How are key individual farmer, farm-level, household and village context characteristics associated with Bridge Phase tenure security, farm rehabilitation, and land use outcomes? Characteristics to be examined include:	a. Individual / Farmer: Age, gender, tenancy status (indigene or asidee vs. abunu), education level.	• Farmers in Bridge Phase villages and in comparison group villages • IPs & IP documentation (secondary data)	• Household survey • GDs • KIIs • Carbon stock measurements on farms	• Perceived tenure security (scale) • Cocoa farm rehabilitation service round 2 uptake (Y/N, measured both as hypothetical and actual uptake if Round 2 is offered) • Likelihood of fallowing & area of fallow (acres) • Likelihood of clearing new land for cocoa or other crops • Area of new land cleared (acres) • Cocoa farm carbon stock (measured as aboveground cocoa and shade tree components in Mg/ha)	• Descriptive summary statistics of related survey data • Difference in difference with statistical matching + heterogeneity analyses • Triangulated with non-experimental pattern / content analysis of qualitative data
	b. Farm-level: Cocoa farm age, farm size.	(as above)	(as above)	(as above)	(as above)
	c. Household: total farm holdings; wealth status.	(as above)	(as above)	(as above)	(as above)
	d. Village: Secondary forest scarcity, social and governance dynamics, market context.	(as above)	(as above)	(as above)	(as above)

Evaluation Question 6 : Key Lessons to Inform Potential Scale-Up

Evaluation Question	Evaluation Sub-Question	Data Source(s)	Data Collection Methods / Instruments	Measure or Indicator	Data Analysis Methods
6. What are the key learning lessons on financial, technical and governance barriers (or enabling conditions) that must be overcome to enable effective scale-up of the integrated Bridge Phase activities, and likelihood of achieving landscape-scale improvements on: strengthening land rights, increasing cocoa productivity, reducing deforestation, increasing carbon stocks, and enhancing local livelihoods?	a. What are main reasons that households or farmers chose not to participate in any of the Bridge Phase activities? To what extent can future activities address these barriers?	(all data sources)	(all methods)	(all results)	Synthesis of body of evidence from the evaluation results, including KIIs with IP and other stakeholders.
	b. Did bridge phase activities reach intended targeted populations, and key sub-groups of interest? (for example: less tenure secure, farmers with declining cocoa productivity)	(as above)	(as above)	(as above)	(as above)
	c. What do the Bridge Phase evaluation findings on intermediate results for each of the three program sub-components suggest with respect to longer term opportunities for improved tenure security, effects on cocoa productivity and livelihoods, and forest land use decisions?	(as above)	(as above)	(as above)	(as above)
	d. What external factors, if any, positively or negatively influenced the ability for Bridge Phase activities to achieve intended results?	(as above)	(as above)	(as above)	(as above)

ANNEX III: POWER DISCUSSION AND CALCULATIONS

Table 1: Minimum detectable impacts for selected outcomes

Analysis unit	Outcome	Evaluation design[a]	Baseline values[b]		Source	Sample size	MDES[c]	MDI[d] (in units of outcome)	MDI (% change from mean)[e]
			mean	SD					
Cocoa Farm Rehabilitation									
Household	Whether left land fallow (%)	RD	33.7	47.3	CRIG	960	0.718	33.9	101%
Household	Whether cleared new land for cocoa (%)	RD	54.5	49.8	KIT	960	0.718	35.7	66%
Household	Cocoa productivity (kg/h)	RD	651.6	853.6	CRIG	960	0.718	612.5	94%
Tenure Documentation									
Household	Had (perceived) tenure security (%)	DID-MCG	73.4	44.2	CRIG	960	0.207	9.2	12%
Household	Had access to credit (%)	DID-MCG	30.5	46.0	KIT	960	0.207	9.5	31%
Household	Cocoa income (USD)	DID-MCG	1907.8	1771.0	KIT	960	0.207	367.3	19%

Notes:

a. RD=Regression discontinuity; DID-MCG=Difference-in-difference with matched-comparison group;

b. Baseline mean and standard deviation information from CRIG 2016 cocoa farmer survey is calculated based on observations from Ghana's Western region only and from KIT cocoa sector study based on observations from Western region only.

c. MDES=Minimum detectable effect size, expressed in standard deviation units;
Calculations assumed a confidence level of 95 percent, two-tailed tests, 80 percent power, 10 percent non-response rate, 25 percent correlations between outcome across baseline and follow-up surveys, and that covariates explain 30 percent of the variation in outcome.

d. MDI=Minimum detectable impact, expressed in units of outcome.

e. Percent change is relative to baseline mean.

Table 1 presents illustrative minimum detectable impact (MDI) calculations for selective outcomes for both the farm rehabilitation intervention and the tenure documentation intervention. MDIs indicate the smallest impact for a given outcome that we are able to detect given the impact evaluation design, sample size, and a number of other parameters such as the confidence level of the hypothesis test (95%), the level of power (80%), and the amount of variation in the outcome explained by the covariates included in the regression analysis (30%). The smaller the MDI, the larger is the power of the design. For the farm rehabilitation intervention, we assume a sample size of 960 from 12 villages with 51 farmers in the treatment group and 909 in the control group. For the tenure documentation intervention, we assume a sample size of 960—80 farmers each from 12 villages—with one-third of them in the treatment group.

Based on these parameters, we first calculate the minimum detectable effect size (MDES) for each intervention, which is expressed in terms of standard deviation units (same across all outcomes). We then calculate the MDI for each outcome by multiplying the MDES with the baseline standard deviation of the given outcome. For the purpose of the MDI calculations, we have used two different sources to obtain baseline mean and standard deviations of the outcomes presented in Table 1—the CRIG 2016 cocoa farmer survey (data from Western region only) and the KIT cocoa sector study (data from Western region only).

The MDES for the farm rehabilitation intervention is 0.718, meaning that any impact smaller than 0.718 standard deviation from the mean will not be detected by our analysis based on the current sample size. In terms of units of outcome, this corresponds to large MDIs. For example, 33.7 percent households have some land they leave fallow at baseline, based on the CRIG survey. The minimum impact that our design will be able to detect at Bridge Phase endline is about 33.9 percentage points or a 101 percent change from the baseline value. Similarly, 54.5 percent of households cleared new land for cocoa production at baseline and the MDI of our design is 35.7 percentage points or 66 percent of the baseline value. For cocoa productivity, the MDI is 94 percent of the baseline value. The primary reason for such low power for the farm rehabilitation intervention is the very low treatment group sample size (51 farmers). In addition, RD designs typically require larger sample sizes.

Despite these constraints, RD remains the best available option for a quasi-experimental analyses of the farm rehabilitation component. Moreover, we recognize that the treatment sample size for the farm rehabilitation is constrained by what is possible for IPs, due to the costly nature of this intervention. While the proposed design for the farm rehabilitation intervention will be powered to detect only large effects, we also note this is in line with the magnitude of effects expected under the Bridge Phase theory of change. As shown in Figure 2 in the EDR report body, several of the key farm rehabilitation outcomes are anticipated to be large and negative at the end of the Bridge Phase, due to the long maturation period required for desired outcomes under the intervention (for example on: cocoa productivity, cocoa revenue, and cocoa farm carbon stock). Eventually, as the newly planted cocoa becomes productive and the planted shade trees continue to grow, these outcomes are expected to transition to large and positive effects, although it is unlikely that this transition will occur by the end of the overall ILRG project in 2023.

Given the MDIs for the RD component, we also consider how this aligns with the anticipated magnitude of change we might expect to see from this type of an intervention over a similar time period. Available studies from Ghana or Cote d'Ivoire suggest that a 94% MDI does align with existing evidence on magnitude of yield improvements that are obtainable from interventions to improve farm management and reduce disease. It also aligns with the very large yield differences that characterize low and high productivity cocoa farms in Ghana. But, we caveat that we have not found a study that reports on changes from a full farm replanting several years out. For cocoa productivity, we also keep in mind that farmers selected for the farm rehabilitation package have farms with very old trees that are highly diseased and unproductive. So, we expect that productivity and cocoa income on those types of farms, in the absence of the rehabilitation service, is low. Cocoa tree age is highly correlated with productivity, and productivity starts to decline after ~ 18 years of age (Kongor et. al., 2018). Very old trees, such as the farm ages eligible for the ECOM rehabilitation program, have dramatically lower productivity. The high disease incidence on older farms also contributes to much lower productivity on such farms. For example, CSSVD has been found to reduce yields by ~ 70%. Black pod disease, which is also widely reported in Western region, is reported to cause mean annual pod losses in Ghana of ~ 40% and the reduction in productivity is estimated at 25% (Kongor et al, 2018; Ameyaw et al, 2014).

In addition, actual cocoa yields for most farmers in Ghana are dramatically lower than potential yields and this large yield gap is also widely noted in the literature. Kongor (2018) cites a current national average yield of 400 kg/ha. The upper end potential yield range that is obtainable in

Ghana is ~385-500% higher, at 1500-2000 kg/ha. Beyond old aged trees and high disease incidence, farm management practices and use of inputs are the main contributors to low yields, both noted to be generally poor among farmers in Ghana. These are also issues that the farm rehabilitation package aims to address, including: proper farm management, using the recommended tree spacing interval, incorporating shade management, proposal weed and pest control, proper pruning and fertilizer application, and so on.

Evidence from field trials in the region also suggest the productivity effect sizes the RD design is powered to detect are within the range of what is feasible to see through this intervention (the literature focuses on cocoa yield improvements rather than income, but the two outcomes are highly correlated). For example, Wessel and Quist-Wessel (2015) report that the average difference between low productivity and high productivity average yields in Ghana is about 400%. Field trials from Cote d'Ivoire showed that simply improving farm maintenance and pest/disease control on existing older farms (trees that are 25-30 year old) improved yields by 40% over a 4 year period. Adding proper fertilizer use into those practices brought the yield increase up to 100%. Other trials show 50-100% higher yields obtainable via improved maintenance and fertilizer/chemical inputs alone. The improvements from full-scale replanting are expected to be higher than this.

Our design is powered well for the tenure documentation intervention because of the large sample size that is much more evenly split between treatment and control; the MDES for the evaluation of effects from this intervention is 0.207. In terms of outcomes, we will be able to detect changes between 12 percent and 31 percent from their baseline mean, for a range of key effects that are anticipated from the receipt of farm tenure documentation (Table 1). Power depends critically on the sample size. We illustrate this in Figure 1 below, which shows how the calculated MDES for the tenure documentation intervention falls (which means that the power rises) as sample sizes become larger. The MDIs for the tenure documentation component are also in range of what may be considered feasible to achieve through this type of intervention, particularly for the tenure security outcome in contexts that have a somewhat higher degree of baseline tenure *insecurity*, such as what we anticipate to be the case for the Bridge Phase communities.

Figure 1: MDES and sample size for tenure documentation intervention