Final Report

Sankofa Dynamic Agroforestry Project

Preliminary findings of scoping study to identify carbon finance opportunities

Zurich, 31 July 2018

South Pole
South Pole Carbon Asset Management Ltd. · Technoparkstrasse 1 · 8005 Zurich · Switzerland
+41 43 501 35 50 · info@southpole.com · southpole.com

Details

Prepared for:

Petra Heid, Head Sustainability and Communication
Chocolats Halba / Sunray
Division of Coop Genossenschaft
Salinenstrasse 70, CH-4133 Pratteln
+41 61 825 9146 · petra.heid@halba.ch · www.Chocolatshalba.ch / www.sunray.ch

Prepared by:

South Pole Carbon Asset Management Ltd. (South Pole)
Technoparkstrasse 1 · 8005 Zurich · Switzerland
southpole.com

Project Manager:

William Garrett, Senior Consultant
+44 20 3705 2549
w.garrett@southpole.com

Project Leader:

Tilmann Silber, Director
+4143 501 35 52
t.silber@southpole.com

Contact person:

Tilmann Silber, Director
+4143 501 35 52
t.silber@southpole.com

Table of contents

Executive summary	**6**
1 Introduction	**7**
Goals of this study	**7**
Methodology	**7**
Introduction to the Sankofa Project area	**7**
History of cocoa production in Ghana	7
Livelihood activities of cocoa farmers	8
Land tenure	8
Climate	8
Soils	9
2 Project Design	**10**
The Sankofa Project – current situation	**10**
Reforestation options	**10**
Identification of potential project planting areas	**10**
Stakeholder analysis	**11**
Monitoring	**12**
3 Carbon aspects	**13**
Eligibility under the Gold Standard	**13**
Additionality	**13**
Baseline	**13**
Carbon removals	**13**
Project emissions and leakage	**15**
Adjustments for risk	**15**
The project potential to generate Gold Standard Verified Emission Reductions	**15**
4 Identification of risks	**17**
5 Way forward	**18**
South Pole	**18**
South Pole budget	**20**
6 Conclusions	**21**
7 Bibliography	**22**
Annex I	**23**

Schedule of meetings 23

Annex II 24

Data obtained from DAF plots installed in 2018 24

Annex III 34

Key assumptions and values used to measure carbon removals 34

Annex IV 36

Characterisation and management of carbon relevant species in DAF plots of Sankofa Project 36

Report from Joachim Milz of Ecotop – shared with South Pole 36

Annex V 40

Approach and Gold Standard phases 40

Preliminary review 40

Initial certification 40

Performance Certification 40

Annex IV 41

Photos 41

List of tables

Table 1. Sankofa project particpants and roles 11
Table 2. DAF carbon removals per hectare 14
Table 3. Sankofa project proposed planting schedule 16
Table 4. Sankofa project schedule for delivery of GS VERs 16
Table 5. Sankofa project risks and mitigation 17
Table 6. Sankofa project implementation timeline 19
Table 7. South Pole budget for the Sankofa project 20
Table 8. Feasibility study schedule of meetings 23
Table 9. List of tree species 36

List of figures

Figure 1. Ghana rainfall map 9
Figure 2. Stratified agroforestry systems 37
Figure 3. Timber tree management 38
Figure 4. Ecotop photo 39

Acronyms and abbreviations

A/R	Afforestation / reforestation
CO_2	Carbon dioxide
CSC	Climate Smart Cocoa
CHF	Swiss Francs
DAF	Dynamic Agroforestry
DBH	Diameter at breast height
ER	Emission Reduction
FPIC	Free, Prior and Informed Consent
GCFRP	Ghana Cocoa Forest REDD+ Programme
GHG	Greenhouse gases
GIS	Geographic Information System
GPS	Global Positioning System
GS	Gold Standard
GS VER	Gold Standard Verified Emission Reduction
ha	Hectare
HIA	Hotspot Intervention Area
ITC	International Trade Centre
LSC	Local Stakeholder Consultation
NDC	Nationally Determined Contributions
PDD	Project Design Document
REDD+	Reduced Emissions from Deforestation and Forest Degradation
SDG	Sustainable Development Goal
t	tonne
VER	Verified Emission Reduction

Executive summary

The purpose of this study was to estimate the project potential to generate Gold Standard Verified Emission Reductions (GS VERs) and to determine the project reforestation area required to deliver 75,000 GS VERs to Chocolats Halba. To achieve this purpose South Pole visited the proposed project area in Ghana from the 14 to 18 May to familiarise themselves with the project, to meet with potential project partners, to understand the proposed project activities and to obtain data to estimate potential changes in carbon stocks as a result of the proposed project activities.

During the visit South Pole visited three Dynamic Agroforestry (DAF) plots established in 2016 and 11 DAF plots established in 2018. South Pole used data obtained from these plots to reach conclusions about the project baseline conditions. The baseline carbon emissions (which must be deducted when calculating the project carbon gains) are estimated to be rather high: average 71 tCO_2/ha due to the removal of existing trees and old non-productive cocoa plants.

South Pole also obtained data to develop tree growth models to measure potential carbon removals (i.e. sequestration) due to the implementation of the project activity (i.e. DAF). The favourable growing conditions in the area indicate fast rates of carbon removals are possible within the project area of up to 13 tCO_2/ha/year (discounted value).

Emissions due to leakage and project emissions are both assumed to be zero.

We conclude that a DAF reforestation area of 400 hectares should be established to generate the 75,000 GS VERs required by Chocolats Halba.

Several project risks were identified during the assessment and are noted below.

- The lack of local capacity to implement DAF amongst participating farmers.
- The proposed implementation partners may not have sufficient presence and expertise within the proposed project area to implement a project at this scale within the proposed timeframe.
- Insecure land tenure and tree ownership rights in Ghana.
- Double counting of carbon gains with the Ghana Cocoa Forest Reduced Emissions from Deforestation and Forest Degradation (REDD+) Programme area which may be allocated towards Ghana's Nationally Determined Contributions (NDCs).

A mitigation strategy has been proposed for each of the identified risks, which should be clearly resolved before proceeding with the proposed project activities.

South Poles budget for their role in the Sankofa Project is CHF 598,168. The contribution requested from Chocolats Halba is CHF 523,163 because South Pole has agreed to provide CHF 75,000 to co-finance the project. South Pole will contribute to all aspects of the project to ensure its successful implementation in order to achieve Gold Standard registration.

1 Introduction

This study was undertaken in response to a request from Chocolats Halba to assess the feasibility of generating 75,000 Gold Standard Verified Emission Reductions (GS VERs) by implementing reforestation activities with farmers that are in their supply chain, as part of the Sankofa Project in Asunafo North District around Goaso in Ghana. This study undertaken by South Pole intends to build upon existing studies relating to carbon finance options within the forestry sector in Ghana, with the primary purpose of reviewing the project's potential to generate greenhouse gas (GHG) emission reductions (ERs) through the implementation of a dynamic agroforestry system with the cocoa farmers that currently supply Chocolats Halba.

Goals of this study

The two goals for this study are noted below.

1. To estimate the potential of the project's activities to generate GS VERs using ex-ante methods of calculation.
2. To determine the project area (hectares (ha) of reforestation) required (by Chocolats Halba) to generate 75,000 GS VERs.

Methodology

The methods used during the work undertaken for this assessment are noted below.

1. Field visit for South Pole to familiarise themselves with the project area and project participants, to better understand the proposed project context and project activities.
2. Interviews with stakeholders including International Trade Centre (ITC), Kuapa Kokoo, Fairtrade Africa, Ecotop and participating farmers. See Annex I for a full schedule of the meeting conducted.
3. Literature review to obtain data, further information of the proposed management systems and to benchmark the results of the South Pole carbon assessment.
4. Data collection relating to pre-project land uses (by measuring the trees cut down in established DAF plots), which was used to quantify carbon emissions for the baseline assessment (see Annex II for a schedule of the sites visited).
5. Data collection by measuring planted trees of a known age of similar tree species to those proposed for use in the project activity in order to generate ex-ante estimates of potential carbon removals by the Sankofa project.
6. Review of critical issues relating to leakage and project emissions.
7. Data analysis and reporting. See Annex III for further details of the methods used for data analysis.

Introduction to the Sankofa Project area

The Sankofa Project is located in Asunafo North District centred around the town of Goaso. This area is commonly referred to as Ghana's cocoa belt. The key characteristics of this area (which are of relevance to the proposed project activities) are described in this section.

History of cocoa production in Ghana

Cocoa was first introduced into Ghana in 1840. Today there are over 800,000 cocoa farmers in in Ghana, which is second only to Côte d'Ivoire in terms of cocoa produced and exported. During the period from the 1970s to the 2000s many cocoa producers in Ghana were encouraged to remove trees from cocoa production areas and to convert to full sun cocoa production systems. This has left a legacy of both reduced capacity amongst cocoa farmers to manage shade systems, and concerns amongst farmers about growing cocoa under shade conditions. These concerns include:

- shade may reduce cocoa yields.
- increased shade is associated with increased rates of disease due to higher levels of humidity – particularly in the wetter areas of Western Ghana.
- trees may harbour rodents that damage cocoa pods.
- falling trees may damage cocoa plants.
- harvesting gangs may remove trees from their land at any time, damaging their cocoa plants in the process with no direct benefit to the farmer.

Livelihood activities of cocoa farmers

All of the farmers visited by South Pole during the feasibility assessment were small scale producers (managing farms of between 1 – 5 hectares). The cocoa farmers visited during this study currently rely exclusively on income from cocoa and are therefore vulnerable to both global factors that may impact cocoa prices and to local factors that may impact production (e.g. climatic conditions, pests and diseases). Several farmers say they are food insecure at certain times of the year.

Land tenure

Private land ownership in Ghana is rare. Less than five percent of farmers in the cocoa sector possess title deeds for their property. The majority of land in Ghana is owned by chiefs who hold title to the land on behalf of the community they represent. Individual farmers are given land user rights through a variety of customary arrangements (verbal). Although land occupancy is matrilineal (based on ancestral descent through the maternal line), land reverts to the titleholder at the end of the lease or where there is a cessation of land use activity for which the lease was agreed. In practice, many farms are leased to other farmers through share-cropping arrangements, which are based on verbal agreements and may not provide evidence of (long-term) user rights.

In addition to these uncertainties associated with land tenure, the State has the right to manage all trees (even those trees which are located on privately farmed land), except where a farmer can prove with documented evidence that they planted a tree – in which case the tree belongs to the farmer. Although trees may be harvested for domestic and local uses, a conveyance certificate is required to transport timber legally, which is issued by the Forestry Commission.

Climate

The climate in this area is characterised as being hot and humid for most of the year, creating very favourable conditions for growing trees. The average annual temperature ranges between 26°C and 29°C, and average precipitation is approximately 1,400 mm per year (see Figure 1).

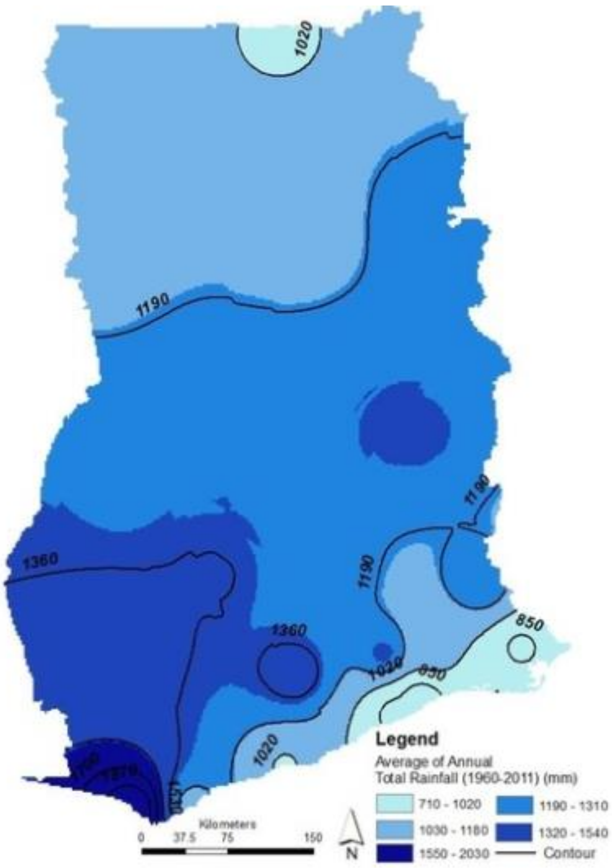

Figure 1. Ghana rainfall map

(Source: Amos et al., 2016)

Soils

In their report on the impact of climate change on cocoa production, Anim-Kwapong and Frimpong (1994) classify soils in Ghana's cocoa belt as 1) unsuitable; 2) suitable; 3) highly suitable for coca production.

Unsuitable soils are highly desaturated ferralitic soils, primarily tropudults and paleudults (forest oxysols and oxysol-ochrosol intergrade). These soils cover the south of the western region. Without fertiliser application, their lack of available minerals results in limited yields and premature tree aging (for trees grown in full sunlight, yields tend to fall around year 10 onwards).

Suitable soils are moderately desaturated ferralitic soils (dystropepts/forest ochrosols). These are primarily found in the old cocoa growing areas of Eastern and Ashanti regions where the Sankofa project is located.

Highly suitable soils are only slightly desaturated ferralitic soils (tropical eutrophic brown soils/ forest ochrosol-rubrisol intergrade) with a high exchange capacity, hence a better response to mineral fertilisers. These are generally well-drained, and deep soils occur in limited areas in Ashanti and in the North of Western region (Anim-Kwapong and Frimpong, 1994).

2 Project Design

The Sankofa Project – current situation

Five hectares of DAF have so far been established through the Sankofa Project in Ghana.

DAF was first piloted in Ghana in 2016 (with the support of Ecotop) with the establishment of five x 0.25-hectare DAF plots. Of the original five plots, only four are still managed as DAF sites. Three of these sites were visited by South Pole.

In 2018, an additional 15 X 0.25-hectare DAF plots were established with further intensive support from Ecotop. 11 of these sites were visited by South Pole in May 2018.

The remaining area of DAF in the project area therefore covers no more than 4.75 hectares.

Reforestation options

The DAF management system is described in detail in Annex IV (Ecotop, 2018).

The intended benefits of DAF when implemented in line with Ecotop recommendations include:

- increased cocoa yields for farmers.
- no required chemical inputs.
- reduced vulnerability to impacts of climate change due to greater stand resilience.
- diversified income for farmers.
- diversified food crops for farmers.
- improved water quality within the landscape.
- enhanced biodiversity within the landscape.

The results presented in this report relate only to reforestation-based implementing DAF. The focus at this stage is on DAF because it is the primary objective of the project and during the field visit for the feasibility study by South Pole, no suitable sites for alternative reforestation options were identified. There may, however, be scope within the Sankofa landscape to implement other reforestation systems that may be able to generate additional insetting opportunities for Chocolats Halba, including the establishment of woodlots and the implementation of agroforestry systems in combination with other crops grown in the area. The adoption of other reforestation systems may be beneficial to the project, in that it would reduce the risk of focussing all project resources onto a single, rather complex reforestation system.

Identification of potential project planting areas

Project planting areas should be both eligible and suitable for reforestation activities.

Chocolats Halba requires that all farmers participating in the implementation of DAF are current members of Kuapa Kokoo.

Eligible sites (according to the requirements of the Gold Standard) must have been deforested for at least 10 years prior to the project activity. Eligible sites will be determined using remote sensing by South Pole once the project implementation begins.

Farmers should be selected for participation based on the principle of Free, Prior and Informed Consent (FPIC). All participating communities should therefore have a full understanding of both the benefits and obligations conferred upon them by entering into a carbon sales agreement. Participating communities should also be given the opportunity to contribute to the design and selection of project activities through a detailed process of Local Stakeholder Consultation (LSC).

In addition to only planting on eligible sites, the project developer should develop criteria to select suitable sites for reforestation.

The criteria may be linked to the following assessment factors:

- minimum farm area
- secure land tenure
- current farming system
- location of farm
- farmers' capacity to implement system

The actual criteria used to determine suitability will be determined during the final project design phase. Based on this assessment, it appears that there are sufficient eligible and suitable areas to achieve the project targets. However, the risks associated with a project scale up are assessed in Section 4.

The plan is to scale the project up through demonstrations (which will help to convince more farmers of the benefits of DAF) and by using trained farmers to work with newly recruited farmers to assist with the fast roll out of DAF. The current proposal is that each farmer trained in the DAF system can help to build the capacity of another 15 farmers through training and shared work.

Stakeholder analysis

This study did not include a detailed or formal stakeholder analysis (because it was not required to achieve the goals of this study). However, an overview of the key stakeholders and their proposed roles in this project is presented in Table 1.

Table 1. Sankofa project particpants and roles

Project participant	Description of role
South Pole	• International anchor and link to international corporates. • Provide technical support to forest establishment, management and monitoring. • Carbon certification. • Guidance on issues relating to Gold Standard and insetting.
ITC	• Local implementation anchor. • Co-ordinate implementation activities with other local partners. • Annual reporting. • Implement rewards mechanism.
Fairtrade Africa	• Local stakeholder consultation. • Farmer selection. • Mapping of project areas. • Procure and deliver tree seedlings to participating farmers. • Farmer training (on tree establishment and management). • Monitoring.
Ecotop	• Design of dynamic agroforestry system • Training of participating farmers in implementation of DAF.
Kuapa Kokoo	• Farmer selection. • Local facilitation. • Support to training events.
Participating farmers	• Implementation of project (reforestation) activities.
Community technicians	• Support training. • Data collection for monitoring.

Local Stakeholder Consultation (LSC) is an important requirement for all Gold Standard projects which should be undertaken by this project prior to the implementation of project activities and reported in line with Gold Standard requirements. The LSC should be gender sensitive and inclusive of all stakeholders, including all participating farmers and others who may be impacted by the project activities. The LSC should demonstrate how all stakeholders have been given an equal opportunity to participate in the project design and implementation of project activities.

Monitoring

A commitment to long-term (30 years) performance monitoring is a requirement for all Gold Standard projects. All reforestation sites included in the project should be mapped (using Global Positioning System (GPS)) and recorded in a geographic information system (GIS) database. The boundaries of the reforestation sites should also be clearly demarcated on the ground so that they may be clearly and easily distinguished when it comes to monitoring. It is also important that any existing trees that are inside the areas of reforestation are marked and recorded in a project database. Gold Standard projects should conduct performance monitoring periodically in order to demonstrate impact towards achieving a minimum of three of the Sustainable Development Goals (SDGs)[1], which should include SDG 13, Climate Impact. Monitoring should be undertaken at least annually during the first few years of the project to help identify any problems or deviations at an early stage. During subsequent years, the performance monitoring should, as a minimum, be undertaken for each verification period (minimum every five years).

Monitoring may either be conducted using a sampled or complete census approach. The approach adopted by the project will be determined according to resource availability and the perceived level of risk (i.e. a complete census approach will yield more complete results but requires extra effort from the project developer).

The monitoring will be used to obtain data of the project climate impact. The following data should be obtained during each round of monitoring:

- reforestation area
- tree species
- survival rates
- tree size data (diameter at breast height (DBH) and height)

It is recommended that effective data recording systems are used by the project developer to obtain monitoring data, and that project participants are trained to support data collection.

[1] For more information on the SDGS, see https://www.un.org/sustainabledevelopment/sustainable-development-goals/.

3 Carbon aspects

The purpose of this section is to present the key findings from this study in relation to the assessment of carbon for the Sankofa Project.

A broader overview of the Gold Standard certification process is included in Annex V.

Eligibility under the Gold Standard

Eligible sites (according to the requirements of the Gold Standard) must have been deforested for at least ten years prior to the implementation of the project activity. Eligible sites will be identified by South Pole based on satellite image analysis and the use of GIS during the project design phase. Reforestation areas should also exclude all wetland areas.

Additionality

The dynamic agroforestry system is currently not in use by any cocoa farmers within the project area. The key barriers to the adoption of this cocoa production system are understood to be cost and capacity set within a context where various policy initiatives over the past 40 years have encouraged full sun cocoa production. The project activity is therefore likely to be additional, however additionality must be demonstrated by applying the Gold Standard additionality test.

Baseline

All carbon emissions due to the removal of existing vegetation should be accounted for in the assessment of climate impact and deducted when calculating the overall project carbon gain (the baseline carbon is therefore shown as a negative value in Table 2). For the purpose of the results presented in this report, an empirical approach has been followed. South Pole visited 11 of the DAF sites, which were installed in 2018 when data was obtained from all the trees and cocoa plants that were cut down in order to implement the DAF system. The average carbon (CO_2) emissions from the removal of existing vegetation are calculated to be 71 tCO_2/ha. In the overall climate impact assessment, the baseline carbon emission must be deducted in the first year of project carbon accounting (i.e. they count as a negative value). There was considerable variance in the baseline carbon data obtained from the 11 sites ranging between 24 tCO_2/ha and 131 tCO_2/ha.

During project implementation, it is recommended:

1. to have target sites for reforestation with lower baseline carbon stocks (i.e. sites that will not require the removal of so many larger trees (some of these sites may not even be eligible since they may already be classified as forest areas)).
2. to stratify the baseline to differentiate between reforestation sites with higher and lower baseline carbon stocks.

Carbon removals

Dynamic agroforestry is a very complex system to measure carbon removals because it involves planting a wide range of tree species with different growth habits and management options. Dynamic agroforestry is also a new management system in Ghana, which has only been piloted on a small scale since 2016. There are therefore no local sites that may be observed or used to obtain data on carbon gains at the stand level. Nor are there any published reports or data of stand biomass or annual increment available for any of the tree species included for reforestation under this project (i.e. secondary data). There is also uncertainty about how the diverse range of tree species will interact together and what impact this may have on future tree growth rates. The management regime requires crown pruning of some species (biomass trees) and side pruning of other tree species (timber trees), which adds further uncertainty to the assessment of carbon removals.

With these limitations in mind, South Pole visited a number of locations within the proposed project area with the objective of obtaining tree growth data from individual trees. Tree height and DBH was collected from each selected tree. The trees selected were of the same species as those proposed for planting under the dynamic agroforestry system (see Annex III). The criteria used to guide the selection of trees are:

- tree species are the same as those to be used for the reforestation project.
- trees have been planted and the year of planting is known.
- trees have been managed in a similar way to that proposed for the reforestation project.
- data points are obtained from trees of several different ages (e.g. trees between 1-10 years old, 11-20 years and 21-30 years).
- data is collected for each age class from several trees (data points).

The data collected was used to develop tree growth models that can be used to forecast carbon removals at stand level over time (i.e. per hectare for the period of certification, which is 30 years). The data points were plotted to establish the relationships between tree age, tree diameter and tree height. Allometric equations were then used to convert the tree size data into tree biomass, which may be multiplied by the number of trees present in the stand (see Annex III for the allometric equations used). Where available, tree specific allometric equations were used. Where several equations were available, South Pole always opted to use the allometric equation that yielded the most conservative result. Biomass may be converted into carbon removals using default conversion factors (see Annex III).

The results of the ex-ante assessment of carbon removals per hectare for the period of the project, above the baseline, are shown in Table 2. The values shown in Table 2 do not include any discounting for risk.

Table 2. DAF carbon removals per hectare

Year	Baseline: carbon emissions due to harvesting (tCO_2/ha)	Net carbon gain (tCO_2/ha)
1	-71	-53
2		-36
3		-19
4		1
5		17
6		35
7		53
8		72
9		91
10		111
11		128
12		145
13		163
14		181
15		199
16		218

17		237
18		257
19		277
20		297
21		318
22		338
23		360
24		381
25		403
26		425
27		447
28		470
29		493
30		516

Project emissions and leakage

Both project emissions and leakage are assumed to be zero.

Project emissions are assumed to be zero because the dynamic agroforestry system requires no use of chemical inputs, whilst the current practice amongst cocoa farmers in the project area is to apply both chemical fertilisers and pesticides.

Leakage is assumed to be zero because the dynamic agroforestry system is designed to increase cocoa yields, whilst also diversifying farmer incomes and providing other livelihood benefits. DAF will therefore encourage farmers to remain in place for longer rather than resulting in the displacement of cocoa production to new areas, which would create further deforestation and GHG emissions.

Adjustments for risk

Adjustments are made to the carbon model to account for both the uncertainty in the ex-ante calculations and to allow some allowance for reversals (i.e. some sites may fail to establish, or they may encounter problems following establishment e.g. due to fires or trees may die due to pests and diseases).

The Gold Standard requires that a minimum of 20% of all GS VERs are allocated to a buffer, to manage this risk across all their projects. In addition, South Pole has discounted a further 20% of the planned emission reductions.

The project potential to generate Gold Standard Verified Emission Reductions

The Sankofa project aims to generate 75,000 GS VERs. Based on the ex-ante method described to calculate the potential to generate GS VERs on a per hectare basis, it is calculated that a total of 400 hectares of DAF should be established to reach this target. The proposed planting schedule for this scenario is shown in Table 3.

Table 3. Sankofa project proposed planting schedule

Year	New area of dynamic agroforestry installed (ha)
2019	100
2020	150
2021	150
Total	**400**

Based on the planting scenario shown in Table 3 it is forecasted that the project will generate GS VERs according to the schedule presented in Table 4, over the 30-year project period between 2019 and 2049.

Table 4. Sankofa project schedule for delivery of GS VERs

Year	Planned number of GS VERs generated within each period
2023	3,000
2028	22,000
2029 - 2049	50,000
Total	**75,000**

The proposed planting schedule assumes a rapid scale up of the project (see Table 3) particularly in years 2019 (100 ha) and 2020 (150 ha). If such a scale up is not achievable during implementation this will impact the timing of the delivery of GS VERs (i.e. they may be delivered later than shown in Table 4, but will not reduce the total number of GS VERs delivered over the lifetime of the project – the project will still achieve the target of 75,000 GS VERs).

If a woodlot system was included as a project activity, this would reduce the area of reforestation required (i.e. the area reduced would depend on the proportion of GS VERs generated through this project activity) and may be easier to implement, because it is a less complex management system than DAF. However, this will only be an option if suitable areas for woodlots are identified amongst the project participants.

The delivery of GS VERs by DAF is forecasted to be slightly higher (from 20% to 40%) than other studies indicate. This is attributable to the two factors below.

1. Other studies focussed on assessing more traditional shade cocoa systems, which do not plant or maintain such a high number of trees per hectare as is practised under the DAF system.
2. South Pole obtained tree size data from the project area to develop models to forecast annual increment for some of the tree species that will be used for DAF.

4 Identification of risks

Table 5 describes the key project risks identified by South Pole during the assessment of the Sankofa Project and suggests a mitigation strategy for each identified risk.

Table 5. Sankofa project risks and mitigation

Risk (description)	Suggested risk mitigation strategy
Lack of capacity amongst farmers to implement a very complex reforestation system.	• Ecotop will have a significant role in training and supervising the implementation of DAF on the ground. • Develop criteria to select suitable farmers and sites for DAF. • Work through model farmers who will help to build the capacity of other farmers.
Implementation partners have inadequate experience to implement DAF at the required scale.	• Clarify the implementation role of Kuapa Kokoo in the project. • Review capacity and resources of Fairtrade Africa to implement project at this scale. • Identify and assess other potential implementation partners.
Timeframe for project scale up.	• Work closely with community representatives and model farmers. • Implement regular and appropriate training. • Align reforestation targets with what is realistically achievable for the project team for each year of the project.
Insecure land tenure and tree ownership.	• Only select farmers with long-term user rights. • The mapping and monitoring requirements will help farmers to demonstrate tree ownership rights.
The entire project focus is on reforestation using the DAF system.	Consider the implementation of other reforestation systems (e.g. woodlots) within the same landscape.
The project is located inside the Ghana Cocoa Forest REDD+ Programme (GCFRP). The Programme started in 2017 and currently all carbon gains generated within the Programme area will be used towards achieving Ghana's NDC. Any claim made on the GS VERs within this area may therefore be considered to be double counting.	• Clarify the evolving regulation with the National REDD+ Secretariat of Ghana. • Back up all 75,000 tCO_2 with GS VERs from another project. • Form a consortium of stakeholders for one of the Climate Smart Cocoa (CSC) Hotspot Intervention Areas (HIA) to invest in activities within this area. This would potentially allow Chocolats Halba greater access to monitoring data, which relates directly to their investment.
Carbon assessment.	(See Section 3 Adjustments for risk) • 20% allocation of forecast GS VERs to GS risk buffer. • Additional 20% discount by South Pole.

5 Way forward

South Pole

South Pole have proposed to have a role in the Sankofa project for ten years. South Pole's role in the project will focus on all aspects of Gold Standard certification, ensuring that the correct procedures are followed in the design, implementation, monitoring and reporting activities. The specific activities that will be undertaken by South Pole include:

- support in the design of project activities that comply with GS requirements.
- eligibility mapping of the whole project area.
- support with local stakeholder consultation (in line with GS requirements), development of the LSC plan, guidance on LSC implementation, the establishment of the grievance mechanism and LSC report for the GS.
- guidance on site suitability and farmer assessment to help select eligible and suitable project sites.
- training of implementing partners for Gold Standard projects.
- guidance on training of participating farmers.
- preparation of GS reporting documents (Project Design Document (PDD), additionality tests and all documents relating to project carbon assessment).
- guidance to help put in place monitoring systems including project area mapping, training for data collection and data recording systems.
- co-ordinate project validation and performance certification.

Throughout the project South Pole will work closely with all other project partners to ensure the successful implementation of this GS insetting project for Chocolats Halba.

The proposed timeline for project implementation is shown in Table 6.

Table 6. Sankofa project implementation timeline

Task	Name of Activity / Task	2018						2019											
		July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
	Decision to implement project	■																	
Phase A	**Initiation phase**																		
A.1	Project Design Study		■	■	■														
A.2	LSC Meeting/Sensitisation				■	■	■												
A.3	Develop implementation and roll out plans		■																
A.4	Contracts in place	■	■																
Phase B	**Project implementation / Carbon registration (2017-2020)**																		
B.1	Finalise project design							■	■										
B.2	Sensitisation							■	■										
B.4	Trainings and capacity building on plantation establishment								■	■	■	■							
B.5	Selection of farmers' proposals - carbon eligible and hidrological benefits - overview									■	■								
B.6	Planting season - Seedlings purchase and transport										■	■							
B.7	Forest database design and set up								■	■	■	■							
B.8	GS validation of PDD																		
B.10	Performance incentives to farmers																		■
Phase C	**Monitoring (2021 - 2028)**																		
C.1	Trainings monitoring and manage plantations to land owners																		
C.2	8 Monitoring campaings																		
C.3	2 Verification/Performance Answers to DOE																		
C.4	Performance incentives to farmers																		

Task	Name of Activity / Task	2020												2021 - 2028											
		January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
	Decision to implement project																								
Phase A	**Initiation phase**																								
A.1	Project Design Study																								
A.2	LSC Meeting/Sensitisation																								
A.3	Develop implementation and roll out plans																								
A.4	Contracts in place																								
Phase B	**Project implementation / Carbon registration (2017-2020)**																								
B.1	Finalise project design																								
B.2	Sensitisation																								
B.4	Trainings and capacity building on plantation establishment	■	■	■	■																				
B.5	Selection of farmers' proposals - carbon eligible and hidrological benefits - overview		■	■																					
B.6	Planting season - Seedlings purchase and transport			■	■																				
B.7	Forest database design and set up																								
B.8	GS validation of PDD			■	■	■	■	■	■																
B.10	Performance incentives to farmers	■	■	■	■	■	■	■	■	■	■	■	■												
Phase C	**Monitoring (2021 - 2028)**																								
C.1	Trainings monitoring and manage plantations to land owners																	■	■						
C.2	8 Monitoring campaings																				■	■			
C.3	2 Verification/Performance Answers to DOE													■	■									■	■
C.4	Performance incentives to farmers																								■

South Pole budget

The South Pole cost for their role in this project over a ten-year period is CHF 598,163. This includes all of the costs associated with GS registration, verification and certificate issuance during the ten-year period. The budget also includes CHF 75,000 for the purchase of 25,000 GS VERs (from other projects) as a back-up in case any issues arise over the claimability of carbon gains generated by projects that are located within the Ghana Cocoa Forest REDD+ Programme area. South Pole have agreed to provide CHF 75,000 to co-finance, so the funding request from WWF/Coop for this project is CHF 523,163.

The South Pole budget allocation for each of the ten years of the project is shown in Table 7.

Table 7. South Pole budget for the Sankofa project

Year	South Pole Costs	GS Costs	Back-up GS VERs (25,000 @ CHF 3 each)	Total
2018	70,613	-	75,000	145,613
2019	129,990	3,675		133,665
2020	104,685	22,575		127,260
2021	16,406	23,625		40,031
2022	16,406	-		16,406
2023	16,406	-		16,406
2024	16,406	-		16,406
2025	16,406	18,375		34,781
2026	16,406	-		16,406
2027	16,406	-		16,406
2028	16,406	18,375		34,781
Total	**436,536**	**86,625**	**75,000**	**598,161**

6 Conclusions

- Despite a strongly negative baseline (-71 tCO_2/ha) the DAF system has the potential to generate significant carbon gains (per ha) over the project life time.
- The project should be able to achieve the scale required (400 ha of DAF). however, it may not be possible to scale the project up in line with the proposed implementation schedule due to the complex requirements of the system and concerns about the lack of existing capacity.
- It is important to identify the right implementation partner that will fully take on board the requirements of conducting a GS project and also has the existing local capacity to implement a reforestation project at this scale.
- Capacity building will be an essential activity for this project because DAF is a new management system in this area, which has complex requirements for its establishment and on-going management.
- Further clarifications are required on the claimability of carbon gains generated by projects with the GCFRP area.

7 Bibliography

Amos T. Kabo-Bah, Chuks. J. Diji, Kaku Nokoe, Yacob Mulugetta, Daniel Obeng-Ofori and Komlavi Akpoti, 2016. Multiyear Rainfall and Temperature Trends in the Volta River Basin and their Potential Impact on Hydropower Generation in Ghana

Anim-Kwapong, G. and Frimpong, E. (1994) Vulnerability of Agriculture to Climate Change: Impact of Climate Change on Cocoa Production, Vulnerability and Adaptation Assessment under the Netherlands Climate Change Studies Assistance Programme Phase 2 (NCCSAP2)

Carbon Fund Emission Reductions Programme Document (ER-PD): Ghana Cocoa Forest REDD+ Programme (GCFRP). 2017.

Ghana Cocoa Board. 2012. The History of Cocoa and its Production in Ghana [Online], available at: http://www.cocobod.gh/history.php

Ruf, F., 2011. The Myth of Complex Cocoa Agroforests: The Case of Ghana, Human Ecology, 39, Forest Carbon Partnership Facility (FCPF)

Annex I

Schedule of meetings

Table 8. Feasibility study schedule of meetings

Date	Description of meetings
14 May 2018	Meeting with Larry Attipoe of ITC in Accra Ghana
15 May 2018	Field work to obtain data from DAF plots installed in 2018 and 2016
16 May 2018	Field work to obtain data from DAF plots installed in 2018 and 2016
17 May 2018	Visit to Forest Reserve with District Forest Officer to obtain data planted trees
18 May 2018	• Field work to obtain data from DAF plots installed in 2018 and 2016 • Meeting with Kuapa Kokoo

Annex II

Data obtained from DAF plots installed in 2018

Date	15 May 2018	
Name of owner	Adomako Samuel	
Reference	Adomako Samuel DAF1	
Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Old cocoa plantation therefore all existing cocoa plants cut back to approximately 3-metre height (left as simple pole)	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
	45	
	47 + 40	
	26	
	36	
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
	35	
	52	
	45	
	41	

Date	15 May 2018	
Name of owner	Jonarh	
Reference	Jonarh DAF2	
Co-ordinates		
Area	Less than 0.25 ha	
Year of conversion to DAF	2016	
Baseline description	Old cocoa plantation therefore all existing cocoa plants cut back to approximately 3-metre height (left as simple pole)	
Planted trees		
Species	**DBH (cm)**	**Height (m)**
Terminalia arborensis	2+2	2
Terminalia superba	5	4
	3	3

	3	3
	2	2
	3	3
Croton (ceiba)	1	1
	3	2
	5	3
	8	5
	10	6
Khaya angolensis	3	3
Oil and salt	1	1
	3	2
Khaya (other)	3 + 1	3
Other (NK)	1	1
Milicia excelsior	2	1
	2	1
	2	2
	1	2
Cashew	2	1
	2	2
	1	1
	1	1
	1	1
	1	1
	1	1
	1	1
	1	
Avocado	3	2
	1	1
	3	3
Mango	2	3
	1	1
	1	1
Orange	1	1

Date	15 May 2018	
Name of owner	Jonarh	
Reference	Jonarh DAF3	
Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Old cocoa plantation therefore all existing cocoa plants cut back to approximately 3-metre height (left as simple pole)	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
	114	17
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
None		

Date	15 May 2018	
Name of owner	Bismark	
Reference	Bismark DAF 4	
Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Old cocoa plantation therefore all existing cocoa plants cut back to approximately 3-metre height (left as simple pole)	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
	48 + 52	17
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
	26 + 35	

Date	15 May 2018	
Name of owner	Emilia Debrah	
Reference	Emilia Debrah DAF 5	
Co-ordinates		
Area	0.25	
Year of conversion to DAF	2018	

Baseline description	Old cocoa plantation therefore all existing cocoa plants cut back to approximately-3 metre height (left as simple pole)	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
Ceiba	120	18
	70	17
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
None		

Date	15 May 2018	
Name of owner	Enoch Debrah	
Reference	Enoch Debrah DAF 6	
Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Old cocoa plantation therefore all existing cocoa plants cut back to approximately-3 metre height (left as simple pole)	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
	14	5
	90	19
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
None		

Date	15 May 2018	
Name of owner	Oti John	
Reference	Oti John DAF 7	
Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Old cocoa plantation therefore all existing cocoa plants cut back to approximately-3 metre height (left as simple pole)	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
	9	4

	28	8
	32	12
	33	9
	59	9
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
None	40	
	27	
	44	
	42	
	55	

Date	16 May 2018	
Name of owner	Thomas Oppong	
Reference	Thomas Oppong DAF 8	
Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Old cocoa plantation therefore all existing cocoa plants cut back to approximately-3 metre height (left as simple pole). Planted some terminalia superb trees on site in past 3-4 years	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
T superba	19	9
	21	9
	20	9
	26	9
	18	9
	18	9
	22	9
	13	9
	16	9
	19	9
	21	9
	17	9
	39	9
Other	90	19

Other	74	19
Other	62	19
Mango	36	5
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
None	39	
	37	
	28	
	58	
	36	
	23	

Date	16 May 2018	
Name of owner	Benaya Quarm	
Reference	Benaya Quarm DAF 9	
Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Old cocoa plantation – stopped harvesting 15 years ago therefore all existing cocoa plants cut back to approximately 3-metre height (left as simple pole)	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
	65	9
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
None	90	
	65	
	56	
	41	
	66	
	59	
	76	
	50	
	66	
	30	
	80	

	67	

Date	16 May 2018	
Name of owner	Adjei Boakye	
Reference	Adjei Boakye DAF 10	
Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Grassland	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
	17	
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
None	14	
	5	
	16 + 14	
	6	
	6	
	6	
	12	
	13	
	7	
	6	
	8	
	12	
	14	
	23	
	14	
	20	
	14	
	15	

Date	18 May 2018
Name of owner	Menseh Gbomdem
Reference	Menseh Gbomdem DAF 11

Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Old cocoa plantation therefore all existing cocoa plants cut back to approximately 3-metre height (left as simple pole)	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
	90	12
	45	7
	14	5
	30 + 25	10
	8	3
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
None	10	
	14	
	29	
	28	
	10	
	10	
	46	
	47	
	17	
	16	
	13 + 18	
	38	
	26	
	10	
	12	
	30	
	15	
	12 + 11	
	13 + 10	
	11	
	10	

Date	18 May 2018	
Name of owner	Bismarck	
Reference	Bismarck DAF 13	
Co-ordinates		
Area (ha)	0.25	
Year of conversion to DAF	2018	
Baseline description	Plantain with a few cocoa plants (5)	
Live trees (that will remain on-site)		
Species	**DBH (cm)**	**Height (m)**
	54	8
	18	5
	25	7
Trees cut down		
Species	**DBH (cm)**	**Height (m)**
	6 + 11	
	24	
	9	
	5	
	5	
	5	
	6 + 7	
	13	
	8	
	18	
	51	
	20	
	10	
	6 + 7	
	13	
	7	
	7	
	21	
	12	
	5	
	4	
	11	

	4	
	14	
	8 + 4	
	14	

Annex III

Key assumptions and values used to measure carbon removals

Tree planting design				Number of trees measured during feasibility assessment	Number of trees assumed for the feasibility calculations of sequestration	Allometric equation used
Species	Number per hectare		Data obtained			
Terminalia superba	23		Ghana 2018	142	69	Volume = 0.024–1.126×DBH+13.521×(DBH^2)
Mansonia altissima	23		None			
Nuclea dedirichii	23		None			
Guibucia ehie	23		None			
Khaya ivorensis	23		None			
Khaya anthoteca	23		Ghana 2018	22	69	Volume = log10(0.0006724)+2.117*log10((DBH))
Terminalia ivoriensis	23		None			
Cedrela odorata	23		Ghana 2018	61	46	Volume = 10^(–3.86+2.52×log10(DBH))
Melicia excellsa	23		Ghana 2018	5	23	Volume = 0.0733+0.000013×(DBH^(2.0596))×(Ht^(1.4004))
Senna Siamea	277		None			
Acacia mangium	277		None			
Albizia sp	277		None		831 (reduced to 415 in year 4)	
Anacardium occidentalis	35		Use data from other projects			
Mangifera indica	35		Use data from other projects		35	Volume = (3.14*(DBH/200)*(DBH/200)*Ht)/3
Persea americana	35		Use data from other projects		70	Volume = (3.14*(DBH/200)*(DBH/200)*Ht)/3
Citrus cinensis	35		Use data from other projects		35	Volume = (3.14*(DBH/200)*(DBH/200)*Ht)/3
Theobroma cacao	833		Not inlcuded			
Elaeis guineensis	69		Not inlcuded			

Default GS parameters of CO_2 – Fixation for tree biomass	
Biomass expansion factor	1.1
Root-to-shoot ratio	0.2
Carbon fraction for tree biomass	0.5
Factor to convert C to CO_2	3.67
Source: GS (A/R) GHG ER and Sequestration Methodology (2017)	

Table 9 Default GS parameters of CO_2 – Fixation for tree biomass

Specie	Wood density (g/cm3)	Region
Terminalia superba	0.440	Africa (tropical)
Mansonia altissima	0.560	Africa (tropical)
Khaya ivorensis	0.448	Africa (tropical)
Khaya anthoteca	0.522	Africa (tropical)
Terminalia ivoriensis	0.430	Africa (tropical)
Cedrella odorata	0.430	Central America (tropical)
Milicia excelsa	0.610	Africa (tropical)
Acacia mangium	0.490	Australia/PNG (tropical)
Albizia lebbeckoides	0.568	Africa (tropical)
Anacardium occidentalis		
Manga indica	0.520	Africa (tropical)
Persea americana	0.516	Africa (tropical)
Citrus cinensis	0.780	India
Theobroma cacao	0.410	South America (tropical)
Source: Zanne et al., 2009		

Table 10 Dry wood denisty values

Annex IV

Characterisation and management of carbon relevant species in DAF plots of Sankofa Project

Report from Joachim Milz of Ecotop – shared with South Pole

Introduction

The following describes in detail the characterisation of each species and their specific management in the context of dynamic agroforestry approach with carbon credits according to GS certification.

Table 11. List of tree species

Characterisation	Scientific name of Tree species	Life cycle	Planting Density	Tree quantity 1 ha
Timber tree species carbon relevant	*Terminalia superba*	>100 years	6 x 8 m	23
	Mansonia altissima	>100 years	6 x 8 m	23
	Nuclea dedirichii	>100 years	6 x 8 m	23
	Guibucia ehie	>100 years	6 x 8 m	23
	Khaya ivorensis	>100 years	6 x 8 m	23
	Khaya anthoteca	>100 years	6 x 8 m	23
	Terminalia ivoriensis	>100 years	6 x 8 m	23
	Cedrella odorata	>100 years	6 x 8 m	23
	Melicia excellsa	>100 years	6 x 8 m	23
Biomass species non-carbon relevant	*Senna Siamea*	>30 years	3 x 4 m	277
Biomass species carbon relevant	*Acacia mangium*	>50 years	3 x 4 m	277
	Albicia sp	>50 years	3 x 4 m	277
Fruit trees	Anacardium occidentalis	>50 years	9 x 8 m	35
	Manga indica	>100 years	9 x 8 m	35
	Persea americana	>50 years	9 x 8 m	35
	Citrus cinensis	>50 years	9 x 8 m	35
	Theobroma cacao	>100 years	3 x 4 m	833
Oil palm	Elaeis guineensis	>100 years	9 x 16 m	69

The above species were carefully selected considering the specific dynamic agroforestry approach and carbon sequestration relevancy.

Design of Dynamic Agroforestry plot

The following grid is representing the planting scheme for 2500 m². All installed fields will be established according the design and the quantity of plants presented below.

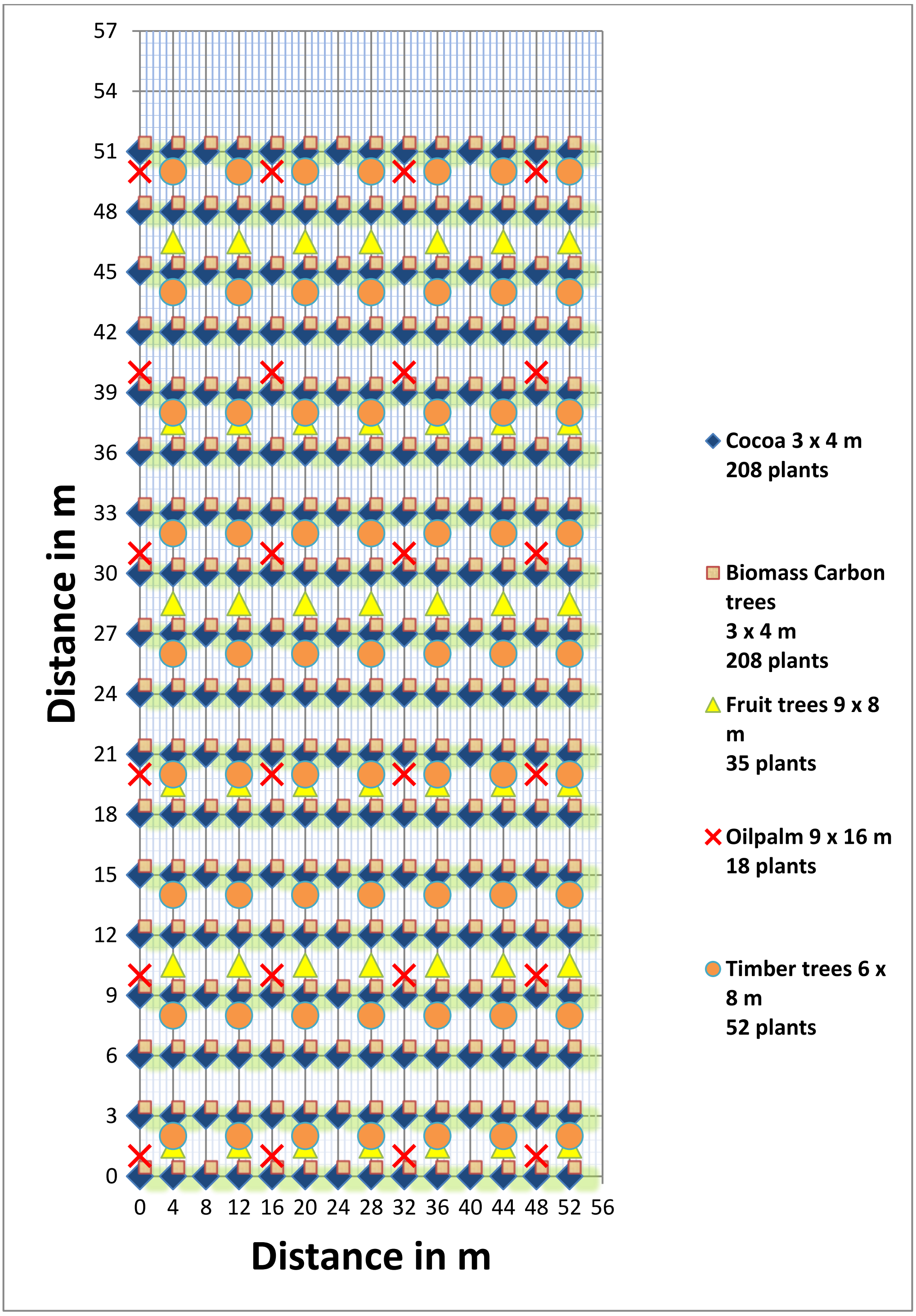

Figure 2. Stratified agroforestry systems

The following figure shows an established agroforestry system after a 20-year development. To increase the carbon sequestration, the proposed design was modified accurately to reach the goal of 75,000 t.

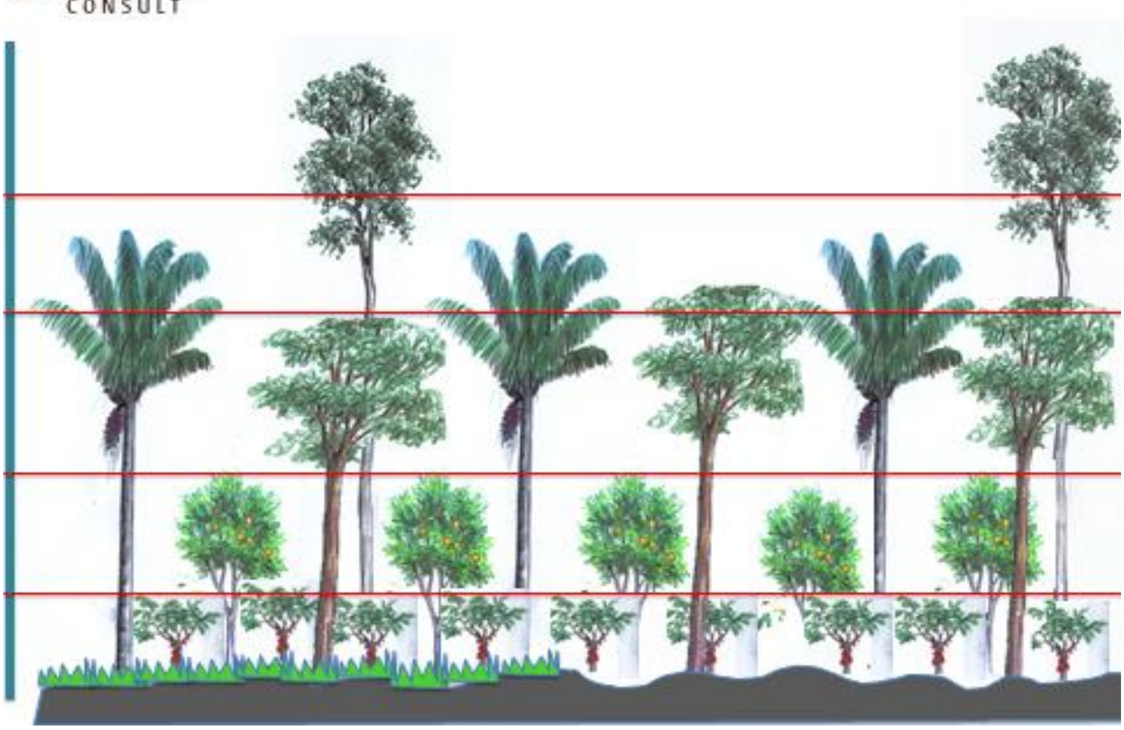

Figure 3. Timber tree management

As the project needs carbon credits and fruit productivity, the management of the DAF system was adjusted to guarantee both issues.

Cocoa plants need a high light input to induce flowering. Therefore, 70 % of all planted timber tree species will be cut off and left at a 7-metre height. The constant pruning technique will increase the annual growth in diameter, which results in improved carbon sequestration in the trunks.

Of the other 30 % of the planted timber tree species, the side branches will be continuously cut off to increase the growth in height. In these cases, the tree crown can be included in the carbon sequestration calculation if desired and permitted by the certification standards.

Management of biomass carbon relevant trees

The DAF system counts with three tree species characterised as biomass species. They are called biomass species because they will provide the system with organic matter by pruning the canopy. Due to the life cycles of each species and their presence in the system, just two of the species are carbon relevant. As the pruning of the species is crucial for biomass production, the carbon sequestration can only be calculated using the volume of the trunk.

The management of the trees will be similar to the timber tree species. They will be cut off and kept on a 4-metre height which, in turn, increases the growth rate in diameter.

Half of the biomass trees will be cut after approximately three to five years.

Figure 4. Ecotop photo

Annex V

Overview of the Gold Standard certification process

To compensate GHG emissions from air transport, Chocolats Halba expects 75,000 Gold Standard Verified Emission Reductions (GS-VERs) from this insetting project in Ghana to be delivered over the project lifetime.

The project will be developed and registered under the procedures of the GS Foundation. Reforestation projects are eligible for carbon credit generation as trees sequester carbon in their growth. The GS allows for the inclusion of new areas after the initial certification. Indicative costs for registration and issuance are shown in Section 5.3 South Pole.

The project will be certified according to the requirements of the GS Methodology for Afforestation/Reforestation Projects.

Approach and Gold Standard phases

GS Certification involves three distinct phases: preliminary review, initial certification and performance certification.

Preliminary review

During the preliminary review, the GS Secretariat checks the project information through a desk review of the project documents. It assesses whether the project is likely to comply with the requirements. If the project complies with the requirements, it is possible to continue to the next phase. Otherwise, the project is not eligible to generate VERs. The preliminary review will likely take place during the second half of 2019.

Initial certification

This phase consists of an audit by an accredited auditor, followed by a review by the GS Secretariat. The project documentation developed will be reviewed through a desk review and a field visit. This is likely to take place in 2020.

Performance Certification

The performance certification also consists of a desk review and an audit with a field visit, followed by a review by the GS Secretariat. For this phase, monitoring of the project areas needs to be performed before the desk review and audit. This phase should occur at least every five years until the end of the crediting period.

All phases described above will be carried out based on the requirements of the afforestation / reforestation (A/R) methodology for GS. South Pole’s vast experience in full development of forestry carbon projects guarantees that all project phases have a great chance of successful implementation under its supervision.

Annex IV

Photos

	
Photo 1. Site cleared in preparation for DAF.	Photo 2. DAF site at two years old (installed in 2016).
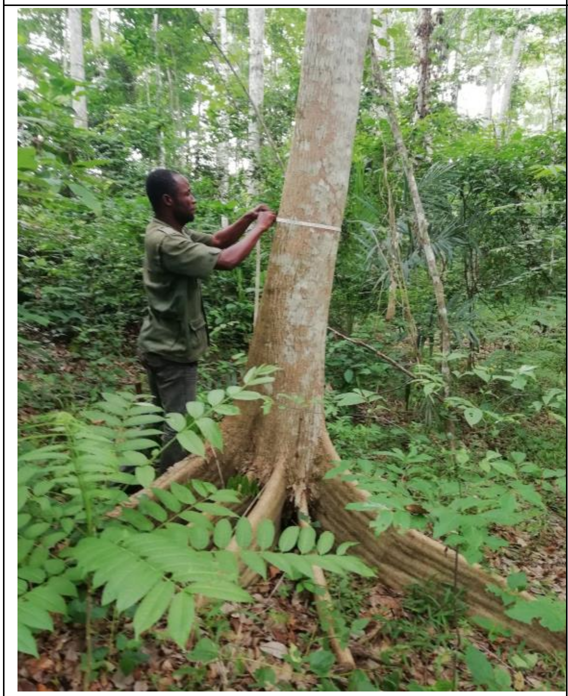	
Photo 3. Measuring trees to obtain data to estimate project carbon removals.	Photo 4. Mature *Terminalia Superba* tree in cocoa plantation (diameter estimated to be over two metres).

south pole