AGROFORESTRY AND REFORESTATION WITH SMALL-SCALE FARMERS IN UGANDA

Document Prepared by PUR Projet

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

'Agroforestry and reforestation with small-scale farmers in Uganda' is a grouped afforestation and reforestation project initiated by PUR Projet in 2016. The purpose of the project is to reforest degraded agricultural land through the promotion of sustainable agroforestry with small-scale farmers located in Uganda.

PUR Projet started the project in 2016 directly working with the Rwenzori Farmers Cooperative Union (RFCU) in the Rwenzori region. The project has the ambition to scale-up over the next decade, and recently started to expand operations with another coffee organisation named Agrievolve.

Between 2016 & 2019, around 270,000 trees have been planted over 590 ha and working with 880 farmers.

In addition to agroforestry activities (socialisation, tree planting, training and monitoring). PUR Projet started Good Agricultural Practices for coffee (GAP) in 2019. comprehensive training curriculum for smallholder coffee farmers consisting in 10 modules covering topics from land preparation to coffee post-harvest practices in order to promote sustainable farming practices aiming to increase coffee yields and quality for potential higher incomes and ensure coffee tree maintenance over the long term.

In February 2019, community theatres were played in 15 different areas. The play raised awareness about socio-economic and environmental challenges including tree planting, conservation, income diversification.

In total the project has completed 7 planting waves in it is mostly working with one nursery who have consistently built-up capacity and expertise over the years with the support of the project. Other community nurseries (7 with RFCU and 4 with Agrievolve) were also established with the aim of mitigating risks and strengthening the positive socio-economic component of the project.

First project validation under VCS standard happened at the same time as the verification. Initially planned in 2020, the first validation/verification audit was postponed to 2021 due to the COVID situation. The scope of this audit is to generate ex-post credits linked to the verification of the waves planted from 2016 to 2019 in the Rwenzori region. For those plantations, the average annual Emission Removals is 1,863 tCO2e and the total ex-ante potential of the project is 65,216 tCO2e over the 35 years of the project duration.

The total GHG emission reductions or removal generated in the first monitoring period is 4,692 tCO2e (after removal of the 10% buffer).

1.2 Sectoral Scope and Project Type

Sectoral scope: AFOLU

AFOLU project category: ARR

Grouped Project: The Project is a grouped project.

Activities (CDM classification):

- Grassland to forested land
- Cropland to forested land
- Degraded fallow to forest land

1.3 Project Proponent

Organisation name	PUR Development Pte. Ltd. hereinafter referred to as 'PUR Projet'
Contact person	Aurélien Cartal
Title	Carbon Senior Manager
Address	336 Smith Street, #07-302, New Bridge Center, Singapore (050336)
Telephone	(+33) 1 55 28 98 05
Email	carbon@purprojet.com www.purprojet.com

1.4 Other Entities Involved in the Project

Organisation name	Rwenzori Farmers Cooperative Union
Role in the project	Implementing partner
Contact person	Jimmy Police Bagonza
Title	General manager
Address	Kogere road, Kilembe Quarter's Kasese Municipality P.O. BOX 414 KASESE
Telephone	+,256,782,466,226

Email	pobaji@gmail.com or rfcul2014@gmail.com

Organisation name	Agri Evolve
Role in the project	Implementing partner
Contact person	Jonny Rowland
Title	General manager
Address	Stockdale Cottage, Longsleddale, Kendal, Cumbria LA8 9BE and at Kisinga Coffee Station in Kasese District of Uganda
Telephone	+,256,776,249,720
Email	jonny.rowland@agrievolve.com

1.5 Project Start Date

The start date of the project is 13/04/2016, date on which the 2016 planting wave started.

1.6 Project Crediting Period

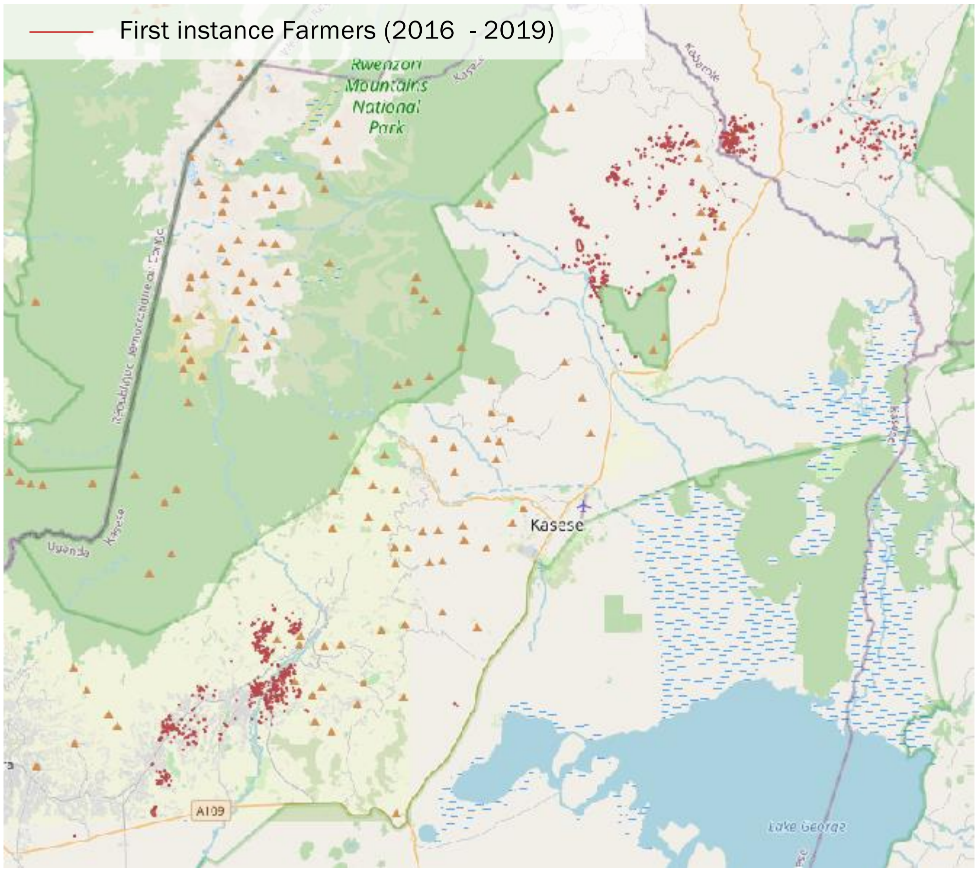
The crediting period is from 13/04/2016 to 12/04/2051. The length of the crediting period is 35 years.

1.7 Project Location

The project is ubicated in the South Ouest part of Uganda, in the Rwenzori area. In the database you can find all the coordinate.

Figure 1: First instance location: Rwenzori Project area

Figure 2: Rwenzori Project area



1.8 Title and Reference of Methodology

Methodology applied:

AR-AMS0007: A/R Small-scale Methodology - Afforestation and reforestation project activities implemented on lands other than wetlands – version 03.1.

Methodology Tools applied in the document:

CDM – AR TOOL 14 – Version 04.2: Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities

A/R Methodological tool 08 "Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity (Version 04.0.0)

Other Tools applied in the document:

Calculation of the number of sample plots for measurements within A/R CDM project activities

1.9 Participation under other GHG Programs

The project is not registered under any other GHG program.

1.10 Other Forms of Credit

Does not apply to this project.

1.11 Sustainable Development

Coffee is Uganda's most important export accounting for 22% of total exports. At the same time, the demand from different funders has also been increasing to scale their demand in tree planting which is a key strength for the project's financial sustainability.

The majority of the farmers have difficulty implementing good agricultural practice. As a result, the project helps them in the short, medium, and long-term by providing complimentary programs such as the Good Agricultural Practices (GAP).

GAP training is provided to farmers as support in the implementation of relevant practices which have an impact on coffee yield, coffee quality (and therefore on coffee price), and coffee productivity over the long-term. The aim being to increase the farmers' revenue from coffee cultivation and reduce the risk of land-use switching from coffee parcels to other attractive crops which do not require shade trees. Such training is a key component of our project design and carbon permanence, as they allow better tree management and tree acceptance within agroforestry parcels of the project, and in the end, help mitigate tree mortality over the short and long term.

The project also contributes to achieving the National Adaptation Plan for Agriculture Sector (NAP-Ag) which contributes to the third National Development Plan (NDPIII) priority of strengthening ecologically-sound agricultural research and climate change-resilient technologies and practices. The main objective of the NAP-Ag is to increase resilience of the Agricultural Sector to the impacts of climate change, through coordinated interventions that enhance sustainable agriculture, food and national security, livelihood improvement and sustainable development.

This is aligned to the adaptation actions of the project which are designed to boost production and productivity for Coffee, Cocoa, Vanilla, forestry, land and natural resources.

Moreover, the project is strongly aligned with 4 of these 17 objectives for sustainable development from UNDP (United Nations Development Program)

- SDG 1: End of poverty: Through agroforestry practices, GAP training and improved cookstoves (coming in 2022), the project aims to secure, diversify and increase farmers' income. Until 2019, around 1,000 families have benefited from trees and until 2020 Around 1,400 farmers have participated in GAP training.

- SDG 5: Gender Equality, the objective is to establish a clear framework for the identification, implementation and coordination of interventions to achieve gender equality and women's empowerment among members of the implementing partners and the farming community through gender sensitisation training and strategy development. The strategy is a guide for planning, resource allocation, implementation, monitoring and evaluation of programs with a gender perspective in line with Uganda's national gender policy.
- SDG 13: Action for the climate: The project acts for climate change mitigation through carbon storage in the trees. From 2016 to 2019, around 270,000 have been planted and at least 2,195,000 new trees planted until 2025.
- SDG 15: Life of terrestrial ecosystems: the project aims at protecting the ecosystem and the biodiversity at landscape level.

2 SAFEGUARDS

2.1 No Net Harm

There is no net harm caused by this project as tree planting under the agroforestry model does not have negative impacts on the ecosystems and farms that implement it. On the contrary, agroforestry is known as a vector of positive livelihood impacts (through revenue diversification) and positive environmental impacts (soil protection and enrichment, increased biodiversity, or water conservation).

2.2 Local Stakeholder Consultation

Local stakeholder consultation was conducted by the PUR Projet coordinators in April 2021, in Kasese. Different stakeholders were involved in presenting and propose the project activities, such as lead farmers, communities, the nursery managers, local partners, technicians and local government representatives. The project idea was well received during this visit. In addition, a grievance system was set up to ensure continuous communication with all stakeholders. Notebooks are available in each sub-cooperative for farmers and lead farmers. A phone number and email are available for other stakeholders.

A report has been sent to every stakeholder invited with the agenda, list of people presents, documentation used during the stakeholder presentation, discussion, and output of the meeting.

See report: stakeholder_consulation_report_V0.1

The following table shows the different points addressed during the meeting and the responses given.

Table 1: stakeholder consultation feedback

Points/issues	Responses/discussion point agreed upon
About incentives: How long will the incentive be given?	- Cash incentive is not for long-term, and therefore, better communication of 'benefits' is needed. Incentives in the form of cash payment is not the only benefit of the PUR Projet. - PUR Projet will make efforts to bring on board other livelihoods-related activities and partners on board during the project. - Important to show/communicate how increased land productivity due to project activity agroforestry/shade trees on crops like coffee/vanilla/cocoa is going to benefit the farmers. - Examples of other projects, where cash incentive is not given to individual farmers, but used to support livelihood related 'projects'/'activities' such as income-generating activity selected by the farmer groups was also communicated in this meeting
Consideration for other types of trees	- Consideration for short-term trees, e.g., fodder trees that can provide food for livestock
Land scarcity/small landholding making tree planting difficult for small farmers	- Project focus is on agroforestry, where trees can be integrated on cropland crops. This is feasible for all farmers, even those with small land holdings. - Farmers with large land holding/extra farm plots can dedicate to woodlots/plantations type of tree planting (planting model M3), but can also integrate crops in between the trees (a system called 'taungya')
Land fragmentation/scarcity and population interaction	- There is a need to address rapid population increase which is causing land fragmentation/scarcity. - This is more a job of local/national government - PUR Projet plans to implement activities to sensitise farmers to land tenure topics and help them to get their title through specific training and support and apply to CCO as proof of ownership of the land
'Bad species,' e.g. Eucalyptus, which has negative impact on environment/water resources	- The project does and will not promote Eucalyptus. It is not an agroforestry species/among the list specifically provided by PUR Projet.
Crops are also trees that absorb carbon: will they be considered?	- Focus will only be on project supported trees
Bamboo is one of the fastest species that observe more carbon and yet is not among the project	- Recommendation appreciated

species. Could you please plan to include it on the list?	
How will the farmers benefit from the audit?	- The audits do not benefit directly to the farmers, but it allows to drive carbon revenues to the project which is spent in activities for the farmers (Free seedling, free training on plantation Free advice during farm visits, cash incentive or free materials based on the number of trees alive & more projects to be developed)
What will motivate a farmer to keep the tree for 30 years and above?	- The project will focus on developing long-term activities that will keep farmers motivated to keep the trees alive. The contractual agreement we sign with farmers is also there to strengthen this aspect. - Ecosystem services provided by the trees will create value for the farmer and for the community (ex. fruits, water resources, soil protection, etc.) and PUR Projet action aims at educating project participants on these aspects.
Who will develop the sustainability activities of the project	- PUR Project and local partners (RFCU and Agrievovle) will develop sustainability activities

In addition, posters were put up in the Union and primary cooperatives in order to remind the beneficiaries about the objectives of the project, key rules of the project and the certification.

Radio communication and community meetings are also used to communicate to the farmers.

- For Community meetings, farmers across the different primary cooperatives were informed and trained on Carbon credits, farmers project agreements, Carbon right transfer and Audit of the project.

- The cooperative organised with local radio stations (Messiah Radio Station, Ngeya station and guide FM radio station) live talk shows focused on the project and carbon credits.The radio talk shows were interactive, listeners could call and request for clarification after the project presentation by the cooperative. Each talk show had a maximum of 10 calls. After the radio shows the cooperatives/project partners informed the audience that they can come to their office in case the farmers need more clarification.

Furthermore, the project itself is built upon a systematic process of yearly Planting Waves. Each given planting wave starts with a consultative process: project socialisation in each community that will potentially receive the project in that year, and then individual visits to each interested farmer. This visit is called “Pre-registry” and allows to confirm farmer’s interest but also to assess eligibility, geolocalisation of the land, determine the planting models and the choice of species. After tree delivery, the process also includes two individual monitoring visits to each participating farmer, thus allowing on-going communication. On top of the visits, technicians maintain regular contact with the farmers. As a matter of fact, in many cases technical teams settle down in the area they manage for the whole planting wave.

The project procedures include several collective and individual exchange opportunities allowing a clear communication on project modalities, covering risks and benefits. In particular, during the socialisation meetings, the project rules are clearly exposed to the farmers. In addition, during these Training sessions, the farmers are inaugurated and explained about the Agroforestry activities and operational structure. They are given an opportunity to share with already existing farmers in the project who are able to explain and share experience.

The results of project implementation and monitoring are regularly communicated to local stakeholders through the project organisational set up and monitoring system. Project data is collected in the field by project technicians of the implementing partners. All the data is then controlled and consolidated by the implementing partners and then by PUR Projet team. Each implementing partner sends a monthly report to the PUR Projet local team and this is followed up by a meeting to debrief on the activities, the deliverable status and monitoring results. Implementing partners are then sharing the information back with the farmers. This also includes information on the results of the process of VCS Program verification and the validation/verification body's site visit. As no major change of risks, costs and benefits the project may bring to local stakeholders, laws and regulations occurred during the monitoring period, no specific communication was done to stakeholders on that topic.

Special training has been given to implementing partners and technicians about the process of VCS Program validation and verification and the validation/verification body's site visit to make sure all parties are aligned and understand their implication. The validation/verification body's site was organised remotely but interviews with various stakeholders of the project were done and the visit was announced with anticipation so any stakeholder could potentially reach out and address comments. No specific comment was received concerning site visit.

2.3 AFOLU-Specific Safeguards

As explained in section 2.2, Local stakeholder consultation was conducted by the PUR Projet coordinators the 20th of April 2021, in Kasese. Stakeholders were contacted by email, phone call, or face to face invitation for the people that could not be reached by phone or email between 10th to 13th of April 2021. Different stakeholders were involved in presenting and proposing the project activities, such as lead farmers, communities, the nursery managers, local partners, technicians, and local government representatives. The project idea was well received during this visit. In addition, a grievance system was set up to ensure continuous communication with all stakeholders. Notebooks are available in each primary cooperative for farmers and lead farmers. A phone number and email are available for other stakeholders.

The main risk farmers participating in the projects are economic, and related to the decision to plant trees on their land such as:

- If not well managed, the trees could generate undesired excess of shading or competition.
- Planting the trees represents a significant investment in time (or money if they pay some staff to do the work).
- They might have other plans for their land in the future (change of crop) that may not be compatible with a high tree cover.
- The planting of trees can take up some space that was other crops can be planted

Such risks are being mitigated by the projects with the respective following measures:

- For each parcel, the choice of the planting model and species is the result of a dedicated, technical conversation between the project technician and the farmer, taking into account parcel reality, farmer vision and motivation to plant, existing shading, existing crops.
- The project team communicates transparently and repetitively about the implications of the decision to participate in the project and the completely voluntary nature of such decision. Besides, the project procedures include the payment of an in kind or in cash incentive paid per living tree at each monitoring (first monitoring normally happens 3 to 6 months after tree planting while second monitoring happens 6 months to 1 year after tree planting). Such incentive is a contribution to the potential budget invested by the farmer to cover the costs related to the planting and management of the trees.
- The socialisation meetings to introduce the project, the pre-registry visit and the signing of the farmer contract are three key steps of the project procedures to allow to clearly state the carbon sequestration objective of the project and the related long-term permanence necessity. The pre-registry discussion also allows us to identify risks of having the farmer cut the trees in a close future.
- Financial or in-kind incentives are being given to continue to motivate the farmers

There is no update to be mentioned regarding any negative impact of the project on local stakeholders' property and land use rights. Participation in the project is fully voluntary and both the land and the trees remain the entire property of the farmers. The project cannot be implemented without the authorization of the farmer who has the legal use of the land. In order to monitor and being able to demonstrate that project is not impacting negatively the land tenure, PUR Projet plans to implement activities to sensitise farmers to land tenure topics and help them to get their title through specific training and support.

Above mentioned project procedures (socialization meeting, pre-registry visits, training modules, monitoring 1 and 1 visits, long-term monitoring visits) as well as punctual communication by phone allow to maintain a constant communication between project technical team and beneficiaries.

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3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project is currently in its 7th year of operation. It has been operating one planting wave per year since 2016, covering more and more extended areas of Rwenzori Region.

The project validation under the VCS standard happened at the same time as the first verification.

Table 2: trees distribution per plantation waves

Planted Wave	Nombre of GPS tracks	Total Delivered	Total M1	Total M2	Total tree alive 2021	Area (ha)
2016	228	49758	46772	45451	13970	143
2017	301	82301	75378	71954	18437	160
2018	183	54982	50355	49253	12730	107
2019	331	82628	78105	75402	22095	181
Total général	1044	269669	250610	242060	67232	590

Over the years the project has been continuously improving quality of operations in various aspects:

- In digitalisation of data collection (Do Form software and tablets) - since 2015
- Training of farmers developed by an expert team - since 2016
- Presence and support of PUR Projet (a project coordinator from PUR Projet based in Kampala is now staffed full time on the project) - since 2020
- Project governance (organisation meeting with primary cooperatives and the union before the start of the project)
- Project vision for the future/ long term vision (organisation of a dedicated workshop led by an expert in collective dynamics and stakeholders' alignment) – 2018
- Improvement of logistics and technical knowledge of local nurseries on tree species and tree production, implementation of nursery quality control procedures – continuous
- Awareness raising Theatre 2020
- GAP livelihood impact of the project study done in 2020

leakage factors

As expected, and described in PDD, 4.31% of total area of the parcels are considered at risk plantations of Model 3 in annual crops land use (4.24%) or perennial crop land use (0.07%) which is less than 5% in addition no significant risk of crop displacement was observed during this monitoring period. Therefore, is negligible.

Monitoring of non-permanence risk factors

Non-permanence risk is minimal (see Non-Permanence Risk Report). Possible destruction of carbon stocks (due to cutting or death of planted trees) will be tracked through the long-term monitoring field visits to every parcel.

So far, there is no major event or change that is affecting the intended GHG benefit of the project. The COVID-19 pandemic has been strongly affecting Uganda. But even at the heart of the crisis the planting wave could be maintained, the project team has been adapting to catch up with monitoring delays.

3.2 Deviations

3.2.1 Methodology Deviations

There is no methodology deviation to report.

3.2.2 Project Description Deviations

There is no project description deviation to report

3.3 Grouped Projects

As this verification happens at the same time as the initial validation, no new instances are included in the groups project so now. New instances inclusions are expected to happen at next periodic verification of the project in 2027.

Each new instance will comply with this eligibility criteria:

owned by smallholders (fewer than 20 hectares)

- not be cleared of native ecosystems within the 10-year period prior to the project start date, as set out in section 3.1.6. of the VCS AFOLU requirements
- not falling under ‘forest’ as defined by the Ugandan government
- owner has clear land-use rights with no land-tenure conflicts
- outside of any conservation area (National Parks, concessions for conservation, etc.)

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data/Parameter	**Carbon Fraction of dry matter**
Data unit	tC/tdm
Description	Total carbon in weight per ton of tree fresh matter.
Source of data	CDM AR Tool 14
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	Reference value
Purpose of Data	• Calculation of baseline emissions • Calculation of project emissions
Comments	

Data/Parameter	**CO2 fraction**
Data unit	T (CO2)/tC
Description	Total CO2 in weight per ton of C in trees.
Source of data	Universal constant[1]

[1] https://ecometrica.com/assets/GHGs-CO2-CO2e-and-Carbon-What-Do-These-Mean-v2.1.pdf

Value applied	44/12
Justification of choice of data or description of measurement methods and procedures applied	Reference value
Purpose of Data	• Calculation of baseline emissions • Calculation of project emissions
Comments	

Data/Parameter	**Root to shoot ratio**
Data unit	Ton dry matter/Ton dry matter
Description	Ratio between belowground and aboveground
Source of data	2019 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4 AFOLU, Chapter 4 Forest Land, Table 4.4. ratio of below-ground to above-ground biomass, Tropical rainforest, Africa IPCC 2006 Chapter 6 Grassland; IPCC 2003; Table 6.4
Value applied	For parcel with tdm.ha <125:0.825 For parcel with tdm.ha >125:0.532 For grasslands: 1.58
Justification of choice of data or description of measurement methods and procedures applied	Reference value
Purpose of Data	• Calculation of baseline emissions • Calculation of project emissions

Comments	

4.2 Data and Parameters Monitored

Data/Parameter	Area planted per strata
Data unit	Hectares
Description	Area planted under each model, in each plantation wave
Source of data	Field Measurement (GPS)
Description of measurement methods and procedures to be applied	Area planted is measured by the project team's technicians, at first parcel monitoring. For model 1, the distance planted is measured, and area is recalculated using the assumption of 5 metre width for the line of trees planted..
Frequency of monitoring/recording	Once
Value applied	See GHG calculation model
Monitoring equipment	GPS device included in smart phones and tablets of technicians, using backcountry software. In some cases, Garmin devices can be used.
QA/QC procedures to be applied	Data is cross-checked in the field by PUR Projet during each visit.
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions
Calculation method	N/A
Comments	- Stored electronically - 100% of the project area to be recorded

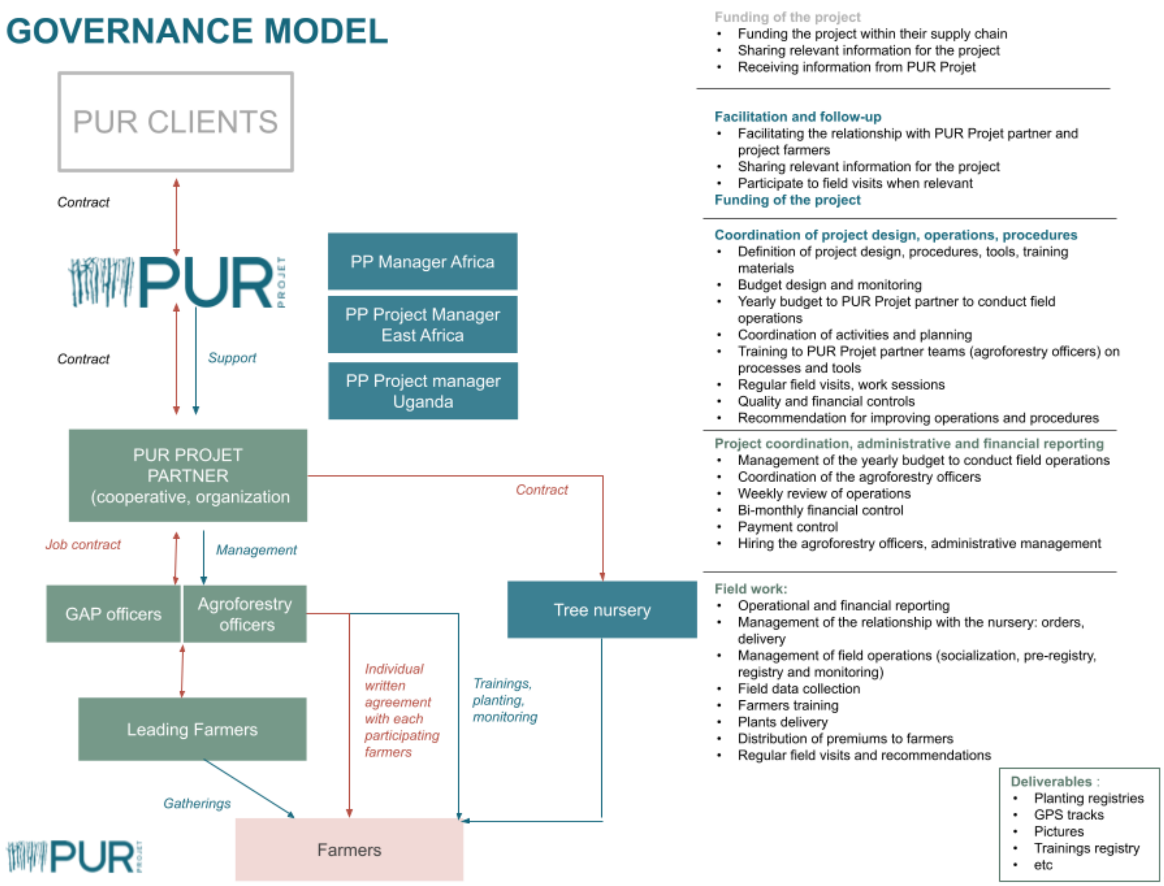
Data/Parameter	Mean Annual Increment per planting model/strata
Data unit	tdm/ha/year
Description	Stock of biomass observed in biomass inventory samples divided by the age of the parcel.

Source of data	Calculation based on measurement of the diameter of trees and converted to tons of dry matter thanks to an allometric equation relevant for the context of the project
Description of measurement methods and procedures to be applied	Field visits and measurement with tape
Frequency of monitoring/recording	After each biomass inventory
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	• Calculation of project emissions (Determination of the ex-post project removals at verification)
Calculation method	Allometric equations are used to calculate above ground biomass in sampling plots. Root to shoot ratio is used to compute below ground biomass. The total is extrapolated to total project area based on the area ratio per strata between sampling plots and total project area.
Comments	

4.3 Monitoring Plan

Global monitoring organisational structure

Figure 3: Generic project implementation structure



The global monitoring structure is linked to the project implementation organisation. PUR Projet signs a contract with the implementing partner (RFCU & Agrievolve). For each planting wave, the contract between PUR Projet specifies a certain number of monitoring deliverables that implementing partner commits to send to PUR Projet while PUR Projet commits to support the technical team with the appropriate tools, methodologies and templates.

The entire project is split into 2 teams according to geographical realities. Each team is managed by a Project Coordinator, in charge of planning, coordination of monitoring activities, and quality control on the data collected by the field technicians. From 2016 to 2019, the team of field technicians was in charge of farmer's training, plantation designs, seedlings distribution, and plantations monitoring. Data monitoring is mostly based on Do Forms application, Backcountry Navigator, Microsoft Excel and Basecamp (data collection, GIS tracking and consolidation / analysis).

Monitoring of plantations

The deliverables per planting wave are the following:

- Excel format PUR PROJET of the parcels registry per wave – Monitoring 1
- Excel format PUR PROJET of the parcels registry per wave – Monitoring 2
- Registration of training

- Filled folder of each project's beneficiary
- Pictures of parcels and plot
- Trees distribution acts

These deliverables include indicators such as the number of trees delivered, number of trees alive, land use before planting, surface planted.

A third Monitoring were done on 100% of parcels by a third party between August to October 2021 to validate the number of trees alive, area planted, and reconfirmed engagement of farmers into this carbon certification.

Monitoring of emissions reductions

Project area stratification

The project area is stratified according to planting years and planting models. Biomass inventories conducted before each verification allow to assess the quantity of carbon stored in the planted parcels. Complete biomass inventories are done on a sample of planted areas.

This stratification leads to 16 strata.

Table 3: Stratification of the project area - inventory of biomass:

Strata	Year	Total equivalent area
S1	2016_M1	4.57
S2	2016_M2A	3.91
S3	2016_M2B	131.21
S4	2016_M3	3.69
S5	2017_M1	6.34
S6	2017_M2A	5.13
S7	2017_M2B	138.78
S8	2017_M3	9.35
S9	2018_M1	3.23
S10	2018_M2A	5.36

S11	2018_M2B	88.19
S12	2018_M3	10.05
S13	2019_M1	8.25
S14	2019_M2A	13.06
S15	2019_M2B	141.18
S16	2019_M3	18.10
TOTAL		**590.38**

Sampling plots selection

The protocol for biomass inventory was designed according to CDM A/R methodological tools: 'Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM projects activities'.

Size of permanent plots

- For planting model 2A and 3 (area planting): 500m2 circular plots
- For planting model 1 (perimeter/line planting): 100 metres' line following planted line
- For planting model 2b, (area planting): 500m2 circular plots and perimeter/line planting): 100 metres' line following planted line

Plots selection

- Planted parcels registered in the database are filtered by strata (planting year and model). For each stratum, a first arbitrary number of parcels will be randomly selected (using a random number generator). This first number of parcels per stratum is chosen arbitrarily based on the size of the stratum (less in smaller strata) and expected biomass quantity (less in more recent waves).
- After the first inventory wave, the results will be plugged in the calculation workbook to compute the variance and uncertainty, and deduct the theoretical number of plots to measure. This will lead to the random selection of additional parcels for each stratum. This process may be repeated several times until reaching the appropriate level of uncertainty below 10%

For each selected parcel the protocol:

- For models planted in line (M1 & boundary of M2b): the end of the sampling line was chosen randomly on the planted line, more than 10 metres away from the end of the planted line (when applicable)
- For all other models (M2a, intercropping of M2b & M3) the centre of the inventory plot was chosen randomly within the contours of the parcels, more than 20 metres away from the edge of the parcel. (when applicable)

Plot demarcation was conducted as follows:

- The centre point of the plot or the end of the sample line (border models) are recorded with GPS. Due to the GPS error and difficulty of having a permanent physical marker for the central point, it has been decided that the central point would be tree n°1. In addition, the field format includes a sketch with the tree numbering.
- The boundary of the sample plot was marked measuring radiuses of the sampling circle with a measuring tape - 12,62 m with the measuring tape in horizontal position (implementing slope correction factors when appropriate, slope > 40%, see correction table in field methodology for the corrected radiuses measured with the tape on the ground).
- All trees falling inside the plot boundaries were numbered with paint on the trunk.

Inventory team training:

- Due to lack of time of field technicians, External technicians were recruited to operate the biomass inventory. The team of external technicians were managed by PUR Projet and supervised to Gilbert Wathum, a carbon expert, recruited for the occasion.
- The coordinators and the entire team of technicians in charge of the biomass inventories for this certification were trained in the PUR Project methodology as well as in the measurement protocol in April 2021 before the field work.
- During this training, the measurement protocol and data collection forms were tested and adapted, also with the objective of homogenising practices between teams

Data recollection / Measurements:

For all planted trees in the sampling plot, the data collected were:

- Diameter at breast height, measured with diameter-measuring tape, measuring the diameter directly in centimetres
- Additional qualitative information was collected: type of tree, observations on the tree and observation on the parcel, number of trees in the parcel
- Measurements were conducted by teams of 3 people, one team leader and two team assistants. Field data was collected on tablets with the ODK application.
- The Excel Workbook for Biomass Inventories computes biomass averages, variances, per stratum, and the total uncertainty based on the inventory data.

Internal Audit

All implementing partners will be reminded on an annual basis about how the monitoring plan is expected to be followed based on the documented procedures. In the case that the plan is not followed and there are non-conformances, all implementing partners will be subjected to quality checks as indicated above, announced or unannounced internal audits of randomly sampled farmers.

A database review will be conducted for selected farmers from different waves followed by an on-farm field visit to verify the information for a given percentage of the farmers.

As describe above, a third Monitoring were done on 100% of parcels by a third party between August to October 2021 to validate the number of trees alive, area planted, and reconfirmed engagement of farmers into this carbon certification.

In addition few parcels have been visited post Biomass inventory calculation is order to check the quality of the data collected.

Monitoring of leakage factors:

As expected, and described in PDD, 4.31% of total area of the parcels are considered at risk plantations of Model 3 in annual crops land use (4.24%) or perennial crop land use (0.07%) which is less than 5% in addition no significant risk of crop displacement was observed during this monitoring period. Therefore is negligible.

Monitoring of non-permanence risk factors

Non-permanence risk is minimal (see Non-Permanence Risk Report). Possible destruction of carbon stocks (due to cutting or death of planted trees) will be tracked through the long-term monitoring field visits to every parcel (see description above in plantation management).

Monitoring of impact on specific topics

The overall approach for monitoring environmental, social and economic benefits was defined by Pur Projet's "Pur Lab" initiative aiming at measuring, quantifying and valuing the social and economic benefits of community agroforestry projects.

Monitoring of socio-economic and environmental impacts of the project can be completed using various strategies: scientific inventories and thematic studies either contracted to experts in each of the fields investigated or conducted by partner universities' students according to protocols defined by Pur Projet, surveys in the communities, and analysis of third-party (potentially public) socio-economic studies, environmental studies.

As of Today, one study has already been started on GAP practicies

The Impact Study was led on GAPs that have been implemented on Wave 2019, comparing farmers with different levels of agronomic practices, to evaluate if farmers with higher levels of adoption of practices have better livelihoods than those with low levels of adoption of practices. This study took place on the RFCU farmers within the Kasese, Bundibugyo, Bunyangabu, Ntoroko, Kabarole districts. Overall, around 100 farmers (and their 100 parcels, with a selection of 1 parcel/farmer) that received GAP training in the year 2019 were surveyed.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As described in the PDD, baseline emissions are calculated from a stratification of the project area:

Table 4: baseline land use stratification

	SB1a Perennial plantations	SB1b Perennial plantations	SB2a Annual Crops	SB2b Annual Crops	SB3b Pasture/ grassland	SB4a Degraded fallow	SB4b Degraded fallow	Total
2016	132.65	1.04	7.04	1.73			0.92	143.38
2017	123.68	3.60	26.58	4.87			0.89	159.60
2018	67.39	0.43	28.51	6.14		0.87	3.48	106.82
2019	99.47		59.85	12.34	0.40	3.16	5.37	180.58
Total	**423.18**	**5.06**	**121.98**	**25.08**	**0.40**	**4.03**	**10.65**	**590.38**

Each reforested parcel is stratified in 8 strata described in above, for which steady-state biomass/carbon stocks are.

The baseline emissions are therefore calculated for each parcel according to its strata. We calculated the evolution of carbon sequestration in the baseline scenario ΔCbsl(t), t CO2e

$$\Delta Cbsl\ (t) = Cbsl\ (t) - Cbsl\ (t-1)$$

ΔCbsl (t) = Net annual Baseline GHG removals. It is calculated in Sheet 1_GHG Credits, column H

Cbsl (t) is the cumulated carbon sequestration in the baseline scenario the year t (tCO2e) It is calculated on sheet 5_summary per Category line 9.

Cbsl (t-1) is the cumulated carbon sequestration in the baseline scenario the year t-1 (tCO2e)

$$Cbsl\ (t) = \sum Cbsl\ (t,i,j)$$

Cbsl (t,i,j) is the carbon sequestration of the parcels j in the baseline scenario the year t (tCO2e)

It is calculated on sheet 3_Baseline from column BC to ED.

Cbsl (t,i,j) = 44/12 * B(ss) (i) * S (t,i,j)

S (t,i,j) is the area of the parcel j in the baseline scenario in the baseline strata i the year t (ha)

B(ss) is the total (aboveground and belowground) biomass (tdm.ha-1) and is calculated as follow,

B(ss) = M(ss) above + M (ss) below

Where

- M (ss) above is the biomass per hectare aboveground (tdm.ha-1)
- M (ss) below is the biomass per hectare belowground (tdm.ha-1)

This calculation can be seen on sheet 3_Baseline from column BF to EG. The total above ground and below ground biomass per parcel (tdm/parcel) calculated as follow B(ss) (i) * S (t, i, j) is done separately on column AX.

Table 5: Parameters used for the calculation of carbon stocks in baseline carbon pools

Stratum	Initial Land-use	Reforestation model	**M(ss) above**	**R**	**M(ss) below**	**B (ss)**	**B (ss)**	**Baseline removed**	**Source**
			tdm/ ha	tdm/tdm	tdm/ha	tdm/ha	tC/ha		
SB1 a	Perennial plantations	Model 1 - 2a - 2b	-	-	-	22	10,3	No	Henk Rikxoort, Götz Schroth, Peter Läderach, Beatriz Rodriguez S nchez. Carbon footprints and carbon stocks reveal climate-friendly coffee production. Agronomy for Sustainable Development, Springer Verlag/EDP Sciences/INRA, 2014, 34 (4), pp.887-897
SB1 b	Perennial plantations	Model 3	-	-	-	22	10,3	Yes	

SB2 a	Annual Crops	Model 1 - 2a - 2b	-	-	-	-	-	No	
SB2 b	Annual Crops	Model 3	-	-	-	-	-	Yes	Transient carbon stocks
SB3 a	Pasture/grassland	Model 1 - 2a - 2b	6,2	1,58	9,8	16	7,5	No	IPCC 2006 Chapter 6 Grassland; IPCC 2003; M(ss) above: Table 6.1 R: Table 6.4
SB3 b	Pasture/grassland	Model 3	6,2	1,58	9,8	16	7,5	Yes	
SB4 a	Degraded fallow	Model 1 - 2a - 2b	6,2	1,58	9,8	16	7,5	No	IPCC 2006 Chapter 6 Grassland; IPCC 2003; M(ss) above: Table 6.1 R: Table 6.4
SB4 b	Degraded fallow	Model 3	6,2	1,58	9,8	16	7,5	Yes	

For annual crops, carbon stocks are ignored since they are considered transient.

For degraded fallows, carbon stocks are considered similar to those of grasslands, as these are abandoned crop plots that become degraded fallows and look like grasslands where natural regeneration is very slow due to severe soil deterioration, and which will not regenerate without a radical change in agricultural and land use practices.

As a result baseline emissions calculated for this crediting period can be summarised as follows:

Table 6: baseline emissions

	Baseline scenario	
Year	Baseline GHG removals Cbsl (t)	Net annual baseline GHG removals ΔCbsl (t)
	tCO2eq	tCO2eq/yr
2016	0	0
2017	5 094	5 094
2018	9 944	4 850
2019	12 636	2 692
2020	16 655	4 019

2021	16 655	0

5.2 Project Emissions

<u>*Results of biomass inventories*</u>

Biomass inventories were conducted across 293 plots in 16 strata. Results of biomass inventories are given in the following table.

Table 7: result of biomass inventories

	BDD data			BD parcels Data			Error Calculation		Carbon calculations							
Stratum	Total equivalent area (ha)	Relative Area	Total number of plots	Number of sampled plots	Measured Average ABG biomass	Standard deviation	Error factor	Relative share	Discounted mean Biomass	AVERAGE Discounted mean Biomass	Discounted mean Biomass	Root-to-Shoot Ratio	Below-Ground Biomass	Total biomass	Total Biomass	Total CO2 capture
	Ai (ha)	wi (%)	Ni (-)	N réel (-)	Btreei (tdm/ha/yr)	Si (tdm/ha/yr)	wi².si²/ni	%	tdm/ha/yr	tdm/ha/yr	tdm/ha	tdm/ha	tdm/ha	tdm/ha	tdm	tCO2
2016_M1	4.57	0.01	91.33	13.00	1.7119	2.22	0.00	0.00	1.65	1.07	5.36	0.83	4.43	9.79	44.71	77.04
2017_M1	6.34	0.01	126.88	34.00	1.4160	1.65	0.00	0.00	1.36	1.07	4.29	0.83	3.54	7.83	49.68	85.62
2018_M1	3.23	0.01	64.63	20.00	0.8223	0.58	0.00	0.00	0.79	1.07	3.22	0.83	2.66	5.87	18.98	32.71
2019_M1	8.25	0.01	164.95	18.00	0.4387	0.82	0.00	0.00	0.42	1.07	2.15	0.83	1.77	3.92	32.30	55.66
2016_M2a	3.91	0.01	78.24	3.00	0.0480	0.06	0.00	0.00	0.05	0.82	4.09	0.83	3.38	7.47	29.22	50.36
2017_M2a	5.13	0.01	102.53	9.00	1.6562	2.20	0.00	0.01	1.59	0.82	3.27	0.83	2.70	5.98	30.64	52.80
2018_M2a	5.36	0.01	107.11	8.00	0.7897	1.26	0.00	0.00	0.76	0.82	2.46	0.83	2.03	4.48	24.00	41.37
2019_M2a	13.06	0.02	261.11	6.00	0.1246	0.22	0.00	0.00	0.12	0.82	1.64	0.83	1.35	2.99	39.01	67.23
2016_M2b	131.21	0.22	2624.17	38.00	1.1802	1.23	0.00	0.34	1.14	0.83	4.16	0.83	3.43	7.59	995.68	1715.89
2017_M2b	138.78	0.24	2775.63	63.00	0.9733	1.09	0.00	0.18	0.94	0.83	3.33	0.83	2.74	6.07	842.52	1451.94
2018_M2b	88.19	0.15	1763.71	28.00	0.7033	0.92	0.00	0.12	0.68	0.83	2.49	0.83	2.06	4.55	401.52	691.95
2019_M2b	141.18	0.24	2823.56	29.00	0.3674	0.77	0.00	0.20	0.35	0.83	1.66	0.83	1.37	3.04	428.53	738.50
2016_M3	3.69	0.01	73.78	1.00	1.5018		0.00	0.00	1.45	1.18	5.90	0.83	4.87	10.77	39.73	68.47
2017_M3	9.35	0.02	187.05	6.00	2.5910	3.73	0.00	0.10	2.49	1.18	4.72	0.83	3.90	8.62	80.59	138.88
2018_M3	10.05	0.02	200.90	6.00	1.3269	1.64	0.00	0.02	1.28	1.18	3.54	0.83	2.92	6.46	64.92	111.87
2019_M3	18.10	0.03	362.06	11.00	0.4020	0.98	0.00	0.01	0.39	1.18	2.36	0.83	1.95	4.31	77.99	134.41
Total	590.38	1	11 807.65	293	0.8330	1.05	0.01	100%	0.80				2.45	5.42	3 200.02	5 514.71

For each strata, measurements made are converted into Mean Average Increment (MAI) dividing the amount of biomass measured (tdm/ha) by the age (years) of the trees on the parcel measured at the date of biomass inventories.

The total uncertainty of measurements performed is 15%, leading to the application of a discount factor on MAI value of 7.5%, according to A/R CDM tools requirements.

Based on these results, an average MAI per type of planting models in calculated as summarised below:

Table 8: Average MAI per planting model

<u>Results used in carbon caculation file:</u>	
Model 1	1.1
Model 2a	0.8
Model 2b	0.8
Model 3	1.2

Carbon stock calculation

C (t) = ∑ C (t,j)

C(t) standing is the stock of carbon in the standing trees planted in the project area the year t (tCO2e);

For each parcel, we calculate the carbon removed from the trees growth planted in the project area:

C (t;j) = C (t;i;j) * Sj

C (t;j) standing is the stock of carbon in the standing trees planted in the project area the year t in the parcel j (tCO2e);

Sj is the total planted area of the parcel j (ha)

C (t,i;j) = 44/12 * CF * (1 + R) * MAIj + C (t-1;i;j)

C (t-1;i;j) is the stock of carbon per hectare of the parcel j of the project strata i in the standing trees the year t (tCO2e/ha)

We consider that the year of the plantation and the year following the plantation C (0;i;j) is nil.

MAIj is the Mean Annual Increment of above ground biomass per hectare(in tdm/(ha*yr)), as measured during the biomass inventories for parcel j strata

The following parameters were used to model and estimate the growth of planted trees within the project area:

Mean annual Increment	tdm/ (ha*yr)	Model 1 1.1 Model 2a 0.8 Model 2b 0.8 Model 3 1.2	Biomass inventory calculation file, using Kuyah et al. (2012) allometric equations for biomass calculations AGB = 0.091xDBH^2.472
R (root to shoot ratio)	tdm / tdm	ABG<125 tdm/ha, R= 0,825 ABG>125 tdm/ha, R= 0,532	2019 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4 AFOLU, Chapter 4 Forest Land, Table 4.4. ratio of below-ground to above-ground biomass, Tropical rainforest, Africa
CF	tC / tdm	0,47	Carbon Fraction - AR TOOL 14

As a result, GhG removals achieved in planted trees can be summarised as follows:

Table 9: GHG removals

Year	GHG removals in planted trees C(t) tCO2eq
2016	0
2017	382
2018	1 197
2019	2 304
2020	3 910
2021	5 515

GHG removals Cbslp (t) in the baseline carbon pools:

For the GHG removals in baseline sinks (grassland, annual crops, coffee trees), according to the Table 3: Parameters used for the calculation of carbon stocks in baseline carbon pools, we consider that:

- for strata SB1a, SB2a, SB3a and the strata SB4a: the baseline carbon pools are unaffected by the tree planting. The trees are planted around the parcel or in an intercropped model, etc.

For the strata SB1b, SB2b, SB3b and the strata SB4b the biomass will disappear:

- for strata SB1b, SB2b: we consider that bushes of baseline pools will disappear (over 4 years) as the trees (planted at high density) grow on the parcel

- for strata SB3b: we consider that the grasses of baseline pools will disappear (over 1 years) as the trees (planted at high density) grow on the parcel
- for strata SB1b: the abandoned coffee trees will degrade slowly over 8 years as the planted trees grow

As a results, baseline sinks removals that stay unchanged in project scenarios can be summarised as follows:

Table 10: Baseline removals

Year	GHG removal in baseline sinks Cbslp(t) tCO2eq
2016	0
2017	5 083
2018	9 898
2019	12 529
2020	16 448
2021	16 353

5.3 Leakage

As expected, and described in PDD, 4.31% of total area of the parcels are considered at risk plantations of Model 3 in annual crops land use (4.24%) or perennial crop land use (0.07%) which is less than 5% in addition no significant risk of crop displacement was observed during this monitoring period. Therefore, it is negligible.

5.4 Net GHG Emission Reductions and Removals

The ex-post net anthropogenic GHG emission reductions and removals are calculated using equation 5 of the methodology AR-AMS0007:

ΔCÆR–CDM,t = ΔCÆCTUÆL.t — ΔCBSL,t — LKt

Where:

- ΔCÆR–CDM,t = Net anthropogenic GHG removals by sinks, in year t; t CO2-e
- ΔCÆCTUÆL.t = Actual net GHG removals by sinks, in year t; t CO2-e
- ΔCBSL,t = Baseline net GHG removals by sinks, in year t; t CO2-e
- LKt = GHG emissions due to leakage, in year t; t CO2-e

VCUs Eligible for issuance = Net GHG emission reductions or removals (tCO2e) – Buffer pool allocation

Year	Baseline emissions or removals (tCO_2e) CBSL	Project emissions or removals (tCO_2e) CÆCTUÆL	Leakage emissions (tCO_2e) LK	Net GHG emission reductions or removals (tCO_2e) CÆR−CDM	Buffer pool allocation	VCUs eligible for issuance
2016	0	0	0	0	0	0
2017	5,094	5,465	0	371	37	334
2018	4,850	5,630	0	780	78	702
2019	2,692	3,739	0	1,047	105	942

2020	4,019	5,524	0	1,504	150	1,354
2021	0	1,511	0	1,511	151	1,360
TOTAL	**16,655**	**21,868**	**0**	**5,213**	**521**	**4,692**

Following the non-permanence risk analysis performed on the project, the overall risk rating is below the minimum level of 10 and is hence considered as 10 according to the AFOLU Non-Permanence Risk Tool guideline 2.5.2.

The number of VCUs to be issued being 5,213, the dotation to risk buffer is hence 10%: 521 VCUs. The total number of VCUs to be issued after buffer is 4,692 VCUs.