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Climate Protection through Forest Conservation in Pacific Island Countries

On behalf of
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
of the Federal Republic of Germany

Feasibility assessment, project description and GHG emissions and removal budget for Penaoru and Petawata, Santo Island, Vanuatu

Concept Note
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SPC Secretariat of the Pacific Community
Growing the Pacific. Growing our future together. L'Océanie, le terreau de notre avenir.
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Introduction

Reducing emissions form deforestation, forest degradation, sustainable management of forests, enhancement and conservation of forest carbon stocks (REDD+) is considered one of the most cost-effective options to mitigate climate change. The Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC) frames REDD+ as one of the building blocks of the post-Kyoto mitigation architecture negotiated in the Ad-hoc Working Group on Long-term Cooperative Action (AWG-LCA) and The Subsidiary Body on Scientific and Technological Advice (SBSTA). While Parties haven't yet concluded on measurement, reporting and verification (MRV) of greenhouse gas emission reductions and Removals (ERR), the modalities for establishing reference (emission) levels and for informing on safeguards compliance have been agreed. The Cancún-Agreements frame REDD+ implementation as a phased approach: Countries are requested to develop their REDD+ strategies or action plans to defined policies to be implemented in the second phase involving capacity building, technology development and results-based demonstration activities, evolving into results-based actions that should be fully measured, reported and verified during the third phase (1/CP.16 par. 73 in FCCC/CP/2010/7/Add.1).

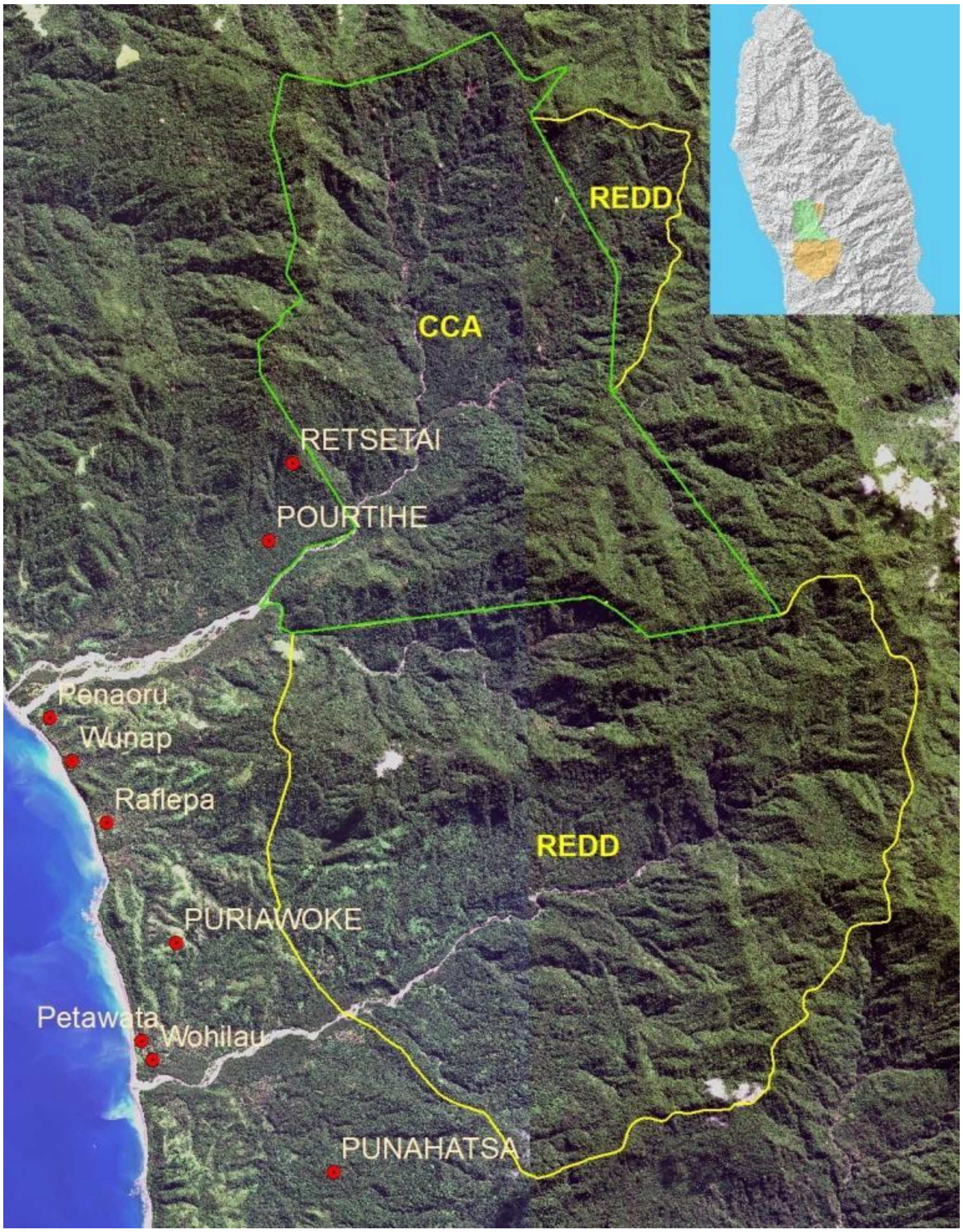
With support of the SPC/GIZ Regional Project "Climate Protection through Forest Conservation in the Pacific Island Countries'", Vanuatu is currently developing its Readiness Preparation Proposal (R-PP) to the Forest Carbon Partnership Facility (FCPF) of the World Bank. The Government of Vanuatu and GIZ agreed to develop REDD+ building on subnational approaches and to pilot the national REDD+ mechanism on Santo Island. Within this subnational pilot, GIZ is aiming at implementing REDD+ pilot activities in the communities of Penaoru and Petawata, located on Santo's West coast.

This concept note assesses the REDD+ emission reduction and removal potential in and around the Community Conservation Area (CCA), adjacent REDD+ sites and the coastal zone of both communities. Section 1 introduces the site. Section 2 assesses its potential in terms of eligible activities and available areas focusing particularly on the potential for enhancement of forest carbon stocks (EFCS). Section 3 estimates the GHG removal potential for three particular tree species (sandalwood, whitewood, and Canarium) the Government of Vanuatu encourages to use. Section 4 describes key elements of a national REDD+ Mechanism which have to be developed to capture the EFCS potential. Section 5 draws some conclusions how to proceed to develop such a mechanism in the context of Santo Island as the first subnational pilot.

1. Site Location

The Penaoru REDD+ project site is located in the Northwest of Santo Island. It has been designed as an extended Community Conservation Area (CCA). Besides the CCA, the site encompasses two connecting areas flagged as REDD+ sites.

Figure 1: CCA/REDD+ Site Penaoru



Background: WorldView-2mosaic Band 5-3-2 (13.06./05.07.11)

Pineda (2011) established the REDD+ project site as follows:

"Boundaries follow as much as possible existing land marks or natural features. The Southern border follows the bed of the Petawata River. On the Northern part, the limits follow the Northern boundary of the Penaoru Conservation Area located on the right bank of the Penarat creek. In the interior the highest crest line running from 1506m at the North and 1547m (Mt. Lolohe) at the South, forms the Eastern boundary of the site. On the Western side gardens and alluvial plains form the artificial limits of the potential REDD+ site."

In 2011, the Limits of the CCA have been extended by the communities of Penaoru to accommodate the REDD+ sites. The boundaries of the extended CCA/REDD+ have been verified by a joint missions of Vanuatu's Lands' and Conservation Departments. In April 2012, the proposal of an integrated CCA & REDD+ site has been presented to the communities of Penaoru and Petawata. Figure 1 indicates the currently considered boundaries.

While the settlement layer of the Vanuatu Resources Information System (VANRIS) shows 6 settlements closed to the site, currently three (Penaoru, Raflepa, and Petawata) are still populated. The Petawata community observed that the site boundaries do not follow the community boundaries. Consequently, the site requires further verification, modification, and approval by the communities. However, this feasibility assessment is based on the original CCA/REDD+ site proposal.

2. Site Potential for REDD+ Activities

2.1 Potential for reducing deforestation

As the WorldView-2 presented in figure 1 indicates, the community areas closed to the coast show significant land cover change. The zoom into a false color composite of WorldView 2 Bands 7-5-2 (13.06.2011) reveals that the area around Penaoru has undergone some transformation. Coconut stands are abundant around the settlements and some of the hill tops closed to the villages appear to be completely deforested (cf. figure 2). Remarkably, the land use change dynamics appears to have started on the hill tops creating a pattern which is quite uncommon compared to other regions. It might have its origin in past settlement patterns, as the communities living across Santo's the West coast originated from the interior of the peninsula. However, the higher areas of the mountain range do not show any signs of past anthropogenic activities. Another factor stimulating the degradation and deforestation of the hilltops might be their exposure towards the sea. While the deforestation in the flat coastal areas has been driven by coconut plantations, taro *(Colocasia esculenta)* farming and cattle ranching shaped the deforestation pattern in the uplands.

Figure 2: Land cover and land use around Penaoru

WorldView-2 image band 7-5-2 (13.06.2011)

The national detection and deforestation analysis Herold et al. (2007) doesn't report any deforestation around Penaoru for the period 1990-2000. At the same time, its 2000 forest mask coincides to a large extend with the current land cover pattern. Thus, one can conclude that most if not all of the deforestation occurred before 1990. Consequently, the current deforestation risk around Penaoru can be considered almost zero assuming that the socioeconomic and economic conditions remain stable. The low deforestation risk limits the potential for any activity reducing deforestation within a REDD+ scheme.

2.2 Potential for reducing degradation

Villagers of Petawata reported that foreigners expressed some interest in starting logging activities within the community's territory about 10 years ago. However, up to now no such activities have been initiated. Considering the logistical challenges of accessing the area it seems unlikely that logging activities might become profitable in the near future. As the WorldView-2 scene reveals, forests around the villages have been partially logged and converted. But these activities haven't moved far into the forest.

Currently, GIZ is considering introducing invasive species management focusing on Big leaf - American rope (*Merremia peltata*) and Mile-a-minute *(Mikania micrantha)*. Both vines are considered a serious threat to natural forest stands as they suppress the regrowth of trees (Tye

2009). Stimulating regrowth by reducing the invasive species' coverage could transform into long-term carbon gains. However, several challenges have to be mastered: The influence of those invasive species on regrowth dynamics (and inherently on the reference emission level) as well as the impacts of management practices have to be quantified requiring extensive field measurements. Apart, the temporal scale of forest degradation driven by invasive species and corresponding mitigation actions will show an impact in the long run making it difficult to quantify their medium term impacts with a reasonable significance and accuracy. In any event, invasive species management would have to be applied at a larger spatial scale to achieve significant carbon impacts. Finally, the technical and financial feasibility of the mitigation and management options have to be explored thoroughly.

2.2 Potential for enhancing forest carbon stocks

The abundant logging gaps, grasslands, and shrub lands around the three settlements in the west outside the CCA/REDD+ site show a relevant potential for afforestation and reforestation activities (cf. figure 1). At the same time, the distribution of shrub lands and grasslands clearly indicates, that the CCA/REDD+ site shows only limited potential for activities enhancing forest carbon stocks (EFCS). Consequently, it would have to be extended to generate a relevant GHG removal potential. As the boundaries of the community territories haven't been mapped yet, it is not possible to estimate the EFCS potential within each community area. Instead, a preliminary estimate has been elaborated covering the CCA/REDD+ site plus the coastal area (red polygon in figure 3). For this analysis, grasslands and shrub lands have been classified applying a supervised classification to an automated image segmentation conducted in SPRING 5.2.

Figure 3: Zones for EFCS activities

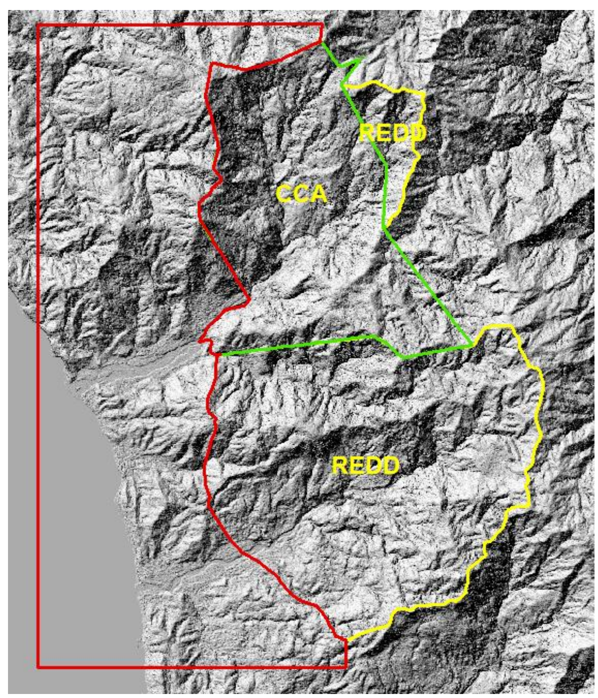
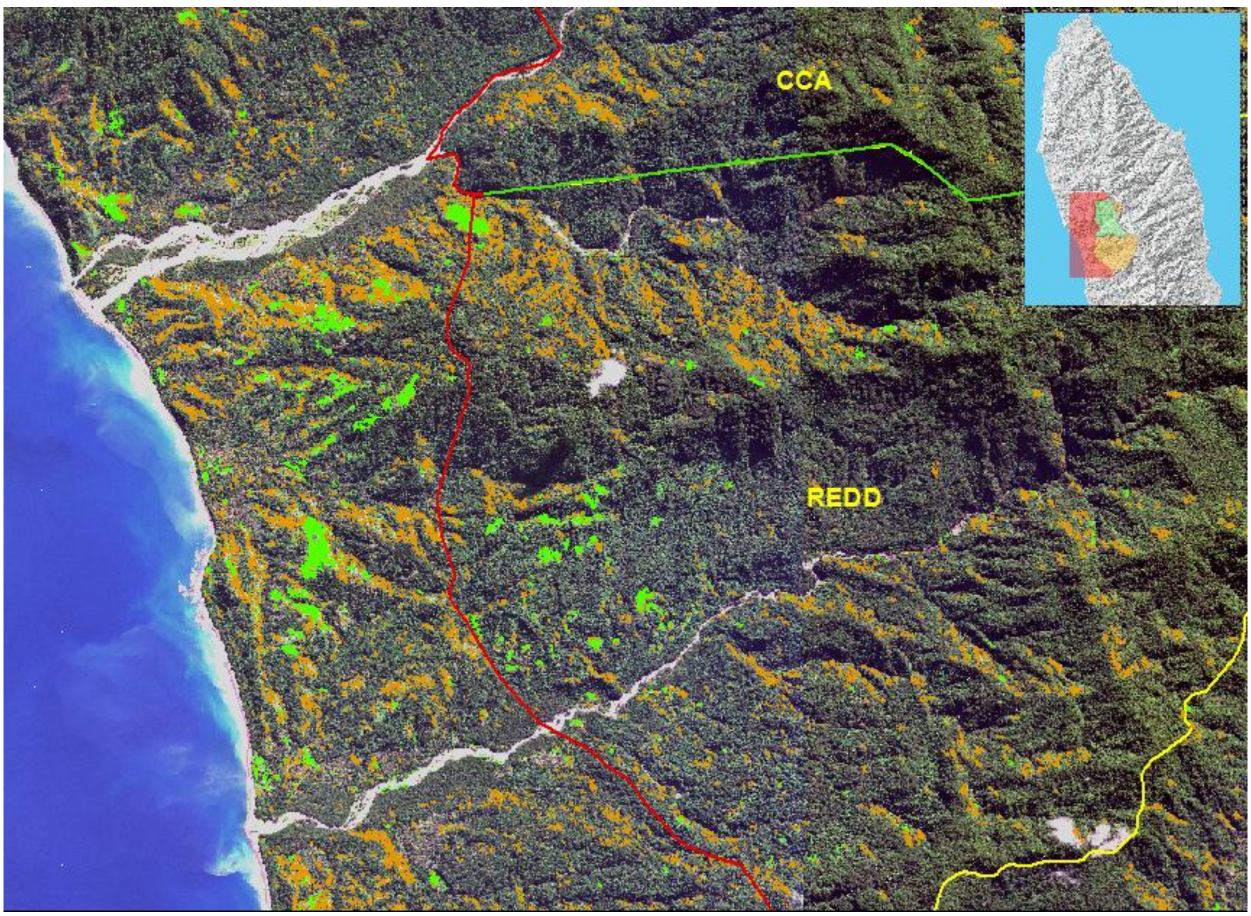


Table 1 indicates the EFCS potential per zone. The total potential reaches 664 ha with a 65% belonging to the coastal areas outside the delineated CCA/REDD+ site. However, the vast majority of the individual sites classified as grassland or shrub lands are small areas of less than 1 ha. Focusing the analysis on areas of 1 ha or larger reduces the overall potential to 219 ha.

Table 1: EFCS Potential around Penaoru and Petawata

Total Area [ha]	CCA	REDD	Coastal	Total
Grasslands	4.6	19.6	74.9	**99.1**
Shrub lands	77.7	131.4	355.5	**564.6**
Total	**82.2**	**151.0**	**430.4**	**663.7**
% of Total	12	23	65	
Sites > 1ha				
Grasslands	0	7.5	36.2	**43.7**
Shrub lands	15.14	27.33	132.73	**175.2**
Total	**15.1**	**34.9**	**168.9**	**218.9**
% of Total	7	16	77	

Figure 4: Distribution of grassland (green) and shrub lands (orange) around the communities



3. Estimation of the EFCS potential

3.1 Methodological approach and applicability assumptions

Up to now, the UNFCCC parties haven't discussed any enhancement of forest carbon stock modalities in REDD+ negotiations. Though several small-scale[1] and large-scale[2] project based methodologies for Afforestation and Reforestation (A/R) Activities have been consolidated under the Clean Development Mechanism (CDM), their requirements (e.g. regarding leakage and additionally) do not fit well into the emerging REDD+ framework. However, these methodologies could guide initial estimates to a certain extent given that REDD+ EFCS activities fit into the applicability conditions of a certain methodology.

In case of Penaoru, it is assumed that site-specific activities will occur at a small scale on abandoned grasslands and shrub lands. Amongst approved small-scale A/R CDM methodologies, AR-AMS0006 provides a simplified baseline and monitoring methodology for small-scale silvopastoral - afforestation and reforestation project activities. The methodology is applicable under the following conditions (AR-AMS0006 vers. 1, p. 1):

a) *Project activities are implemented on degraded croplands or grasslands subjected to grazing activities;*
b) *Project activities lead to establishment of forest (according to area, height and crown cover thresholds reported to the EB by the host Party) in a silvopastoral system;*
c) *The pre-project crown cover of trees within the project boundary is less than 20% of the threshold for crown cover reported to the EB by the host Party.*

The methodology further assumes, that "*the increase in emissions attributable to the project activity above those that occur in the baseline is expected to be insignificant*" and that *"the baseline net GHG removals by sinks are assumed to be insignificant and are accounted for as zero."* The methodology accounts for carbon stock changes in living above and belowground biomass, and soil organic carbon. To estimate aboveground biomass *ex ante*, either a Biomass Expansion Factor (BEF) approach or method based on allometric equations can be used.

3.2 Methodological steps and assumptions

Stratification

The methodology requires stratifying sites at least by tree species, age classes, and silvopastoral practices if significant in terms of GHG removals. Regarding tree species, the government of Vanuatu is promoting the use of Whitewood (*Endospermum medullosum)*, Mahogany (*Swetinia macrophyllia)*, Sandalwood (*Santalum austrocaledonicum)* and Nangai (Canarium *indicum)*. So far, no decision has been taken, whether a future national EFCS mechanism will promote those or additional species. Here, the three species sandalwood, whitewood, and Nangai will be used as a basis for estimating the GHG removal potential, as they offer a high potential for agroforestry and gardening systems:

[1] Cf. http://cdm.unfccc.int/methodologies/SSCAR/approved
[2] Cf. http://cdm.unfccc.int/methodologies/ARmethodologies/approved

Sandalwood *(Santalum austrocaledonicum)* shows a high commercial potential for smallholders on Vanuatu due to its aromatic oils extracted from the heartwood and roots. It is considered one of the world's most valuable tree products (Page et al. 2012). Its site and management requirements are well documented (Thomson 2006a; Thomson et al. 2011), but species specific allometric information is still anecdotal (Cropwatch 2008). Vanuatu's Department of Forestry (DoF) is promoting sandalwood grafting as a propagation method (Tate, Sethy, and Tungon 2006).

Whitewood *(Endospermum medullosum)* is a fast-growing timber species used in agroforestry systems allover Vanuatu. Its utility and farm-applications are well documented (Thomson 2006b). Its growth and yield characteristics have been compiled and simulated based on information available in Vanuatu (Grant et al. 2012).

Nangai (Canarium *indicum)* is well known for its timber and its nuts used as traditional food. While its commercial industry is still in its infancy the species shows a certain commercial potential for tourism and domestic and export markets (Nevenimo et al. 2006; PARDI 2007). As in case of the other preselected species, site and management requirements are well documented (Thomson and Evans 2006), but information of tree growth and allometry is anecdotal (Cornelius 2012).

At this stage of the analysis, age classes are not considered assuming that all species are planted during the first year. Species-specific silvicultural practices are anticipated at the level of the planting scheme. However, site preparation, planting density, species' combination, and silvicultural practices depend on site specific conditions which have to be assessed on the spot. The following sections apply the step-wise approach of the small-scale methodology AR-AMS0006.

Step 1: Ex-ante determination of allometric parameters

In case of ***Sandalwood***, basal diameter increments are reported by Thomson (2006a) and Page et al. (2012). It is assumed that diameter increments decrease from 1 to 0.6 cm/yr over a 40 years rotation period for enrichment and new garden plantings (Page et al. 2012). Diameter at breast height (DBH) is estimated to reach 90% of the basal diameter. A mean wood density of 0.758 g/cm^3 (oven dry mass/fresh volume) for *Santalum spp.* has been calculated based on different Santalum species wood densities reported in the Global Wood Density Database (Jerome Chave et al. 2009; Zanne et al. 2009) reports for sandalwood.

For ***Whitewood***, tree height and DBH growth where simulated based on the model developed by (Grant et al. 2012). The model takes into account stocking reduction and a basal area maximum at the stand level. The Global Wood Density Database provides a species specific wood Density of 0.327 g/cm^3.

On growth of ***Canarium indicum,*** only little information is available. Anecdotal information from Papua New Guinea on stand ages and mean DBH (Cornelius 2012) has been combined with generic information on growth (Thomson and Evans 2006) to derive a regression between stand age and

DBH[3].Annual height increments of 2.75 m were applied until the tree reaches a maximum height of 40m. Due to the weak evidence, the Canarium growth estimates have to be considered highly uncertain.

Step 2: Calculating above-ground biomass for individual tree species

As species specific allometric equations are not available, the following pantropical allometric equations for wet forest stands (J. Chave et al. 2005) have been used to calculate tree-specific above-ground biomass:

(1) $AGB_{est} = 0.0776 \times (\rho D^2 H)^{0.940}$

(2) $AGB_{est} = \rho \times exp\left(-1.239 + 1.980 ln(D) + 0.207\big(ln(D)\big)^2 - 0.0281\big(ln(D)\big)^3\right)$

With:

ρ: wood density [g/cm^3]

D: Diameter a breast height [cm]

H: Tree height [m]

The two parameter form (equation 2: DBH, wood density) has been applied to Sandalwood, while the three parameter form anticipating additionally height (equation 1) was used for whitewood and Canarium. Aboveground biomass per tree and year was calculated for a period of 40 years.

Step 3: Estimating Above-ground carbon stock per ha and year

Above-ground carbon stocks per tree and year where derived multiplying aboveground biomass per tree and year with the Carbon fraction of dry matter set to the IPCC value of 0.5 t C t-1 d.m. as established by the methodology. To calculate per hectare carbon stocks for each year, tree carbon stocks were multiplied with the stocking density. Due to the lack of reliable models, for Sandalwood and Canarium constant long-term stocking densities of 100 and 125 trees/ha were assumed based on documented experience (Thomson and Evans 2006; Thomson 2006a). For whitewood, the model of Grant et al. (2012) predicts the stocking reduction over time as a function of the diameter increment and basal area.

Step 4: Estimating carbon stock in below-ground biomass per tree and year

Carbon stocks in below-ground biomass [tC/ha] were estimated multiplying aboveground carbon stocks with a default root-to-shoot ratio of 0.37 for tropical rainforest reported in Table 4.4of the IPCC AFOLU Guidelines (Eggleston et al. 2006).

Step 5: Calculating total carbon stocks in the living biomass

Total carbon stocks [tC/ha] were calculated summing up aboveground and belowground carbon stocks for each year. Carbon stock changes in soils are not considered as the methodology only accounts for soil organic carbon increments in strata that do not contain organic soils.

[3] For parameters are and calculations cf. the Excel file Penaoru_3Species_Growth_Parameters_vers1.xlsx.

3.3 Estimation of the removal potential

Table 1 indicates the accumulated total carbon stocks [tC/ha] for selected years over the project lifetime.

Table 1: Total carbon stock per species for selected years [tC/ha]

	year 8	year 20	year 30	year 40
Sandalwood	1.6	10.1	22.5	38.5
Whitewood	45.0	181.8	313.4	414.3
Canarium	21.0	184.5	336.6	484.9

Sandalwood shows the lowest removal potential, but offers the highest economic return in the long run due to the value of its oil. Being a fast-growing species, whitewood shows a high removal potential translating into short- to medium term financial carbon benefits. Canarium seems to perform similar to whitewood. However, the Canarium estimates are highly uncertain due to the lack of suitable data. Table 2 provides the mean annual GHG removals [tCO2e/ha/yr] for different species and periods.

Table 2: Annual GHG removals [tCO2e/ha/yr]

	year 1- 8	year 9-20	year 21-30	year 31-40
Sandalwood	0.7	2.6	4.5	5.9
Whitewood	20.6	41.8	48.3	37.0
Canarium	9.6	49.9	55.8	54.4

Planting whitewood on the whole 219 ha flagged as the total EFCS potential (Table 1) would yield annual GHG removals of 4,511.4 tCO2e.

The choice of the species combination depends on different criteria. Biophysical constraints (soils, availability of seedlings, pests and diseases), economics (demand of non-timber forest products, transaction costs, market access), and silvicultural technology have a strong impact on the financial performance of different systems. Consequently, a cost-benefit analysis would have to be conducted to determine the optimum solution taking into account the site-specific conditions, non-carbon co-benefits and the preferences and expectations of the landowners. The model developed by Grant et al. (2012) can be used as a blueprint for such an analysis. However, developing a similar stand specific model for different species combinations requires in-situ measurements of growth parameters for Whitewood and Canarium.

4. Key elements of a national EFCS Mechanism

Considering the achievements of UNFCCC REDD+ negotiations up to now, it doesn't seem probable that parties will agree on more details regarding the MRV modalities in the next two years. Consequently, it is up to the parties to establish operational mechanisms at national and subnational level which facilitate the transition from readiness and pilot activities towards fully performance based REDD+ operations subject to MRV. To make enhancement of forest carbon stocks work, a couple of elements have to be designed and provided:

(Sub)national registry, benefit sharing and incentive mechanism: While there is a good potential for combining carbon, timber, and non-timber benefits in A/R activities, there is a risk, that these activities are starting too small and too diverse at the community level causing high transactions costs in the long run when it comes to MRV. To achieve accountability of A/R activities implemented by smallholders they need to be registered and have to operate in a standardized mode. A national registry has to be set up which tracks eligible activities, accounts for GHG removals, assesses non-permanence risks, and channels performance-based financial incentives to participants. The registry requires and institutional and legal framework and needs to establish procedures to share benefits amongst participants and governmental entities. Standardization of eligible activities is necessary to assure accountability and comparability of mitigation activities. One crucial aspect is the scale of eligible activities. Experience with A/R activities in other countries shows, that the transactions costs of monitoring disperse small activities could exceed their potential benefits. One way to reach a relevant scale is to encourage landowners or communities to cooperate and pool their resources. Another option would be to define a threshold for the minimum size of a system to be registered. Apart, suitable incentive or payment mechanisms need to be found that suit the requirements of rural communities.

Contractual arrangements with landowners: A national registry needs to establish legal provisions for carbon rights and mutual obligations between landowners and governmental entities. Standard contractual forms need to be developed to facilitate the implementation of EFCS activities and to assure long-term legal security and integrity of the national REDD+ mechanism.

Technical guidance and extension services: The review of available resources for the three selected species indicates that sufficient guidance on management and silvicultural practices exists. However, the information is provided in a way that doesn't fit to the needs of potential users in rural communities. System descriptions, trainings, and field manuals have to be developed, which explain the agroforestry management options, their technical requirements, and risks in intelligible ways taking into account the cultural context. Standardized A/R activities require ongoing support and extension services during the initial phase. This type of support has to go beyond the merely silvicultural practices covering value chain development for timber and non-timber products.

Seedling production might become a bottleneck for some species. Sandalwood seed production has proofed to be challenging. Grafting and establishment of seed orchards have been introduced successfully, but haven't reached the scale to enhance the production of seedlings at the island level. Seed production has to be scaled up and will require Readiness finance.

Product and value chain development: At the current stage, demand for timber and non-timber forest products in rural communities can be met by the supply provided by natural forests. Introducing additional production opportunities via A/R activities aims at enhancing income opportunity at the community level. However, additional income beyond carbon based incentives will only materialize if agroforestry products meet existing demand in terms of quality and if they can be produced at costs which are being covered by current prices. Distance to markets and transport costs are limiting factors which set barriers to developing the production in remote areas. Efforts are already under way to assess, establish and enhance value chains for Canarium nuts and sandalwood oil. Vanuatu already has a 200 years trajectory in marketing sandalwood products. But its share in international production reaches only 1-2% (Page et al. 2012) pointing at impeding factors for enhancing production which have to be assessed. Care has to be taken to stimulate or enhance production in those areas which have a good potential to supply markets at a reasonable level of costs.

Tree allometry, measurement and monitoring protocols: EFCS carbon accounting requires sound tree allometry, growth and yield parameters for selected key species. Section 3 indicated, that there is only very limited information to assess the GHG removal potential of the three species. Consequently, key allometrics and growth curves need to be developed by measuring existing stands applying approved protocols.

It isn't necessary to start developing all elements at the same time. Defining the technical terms for eligible A/R activities (site requirements, eligible activities) are of utmost importance for facilitating early action. Developing technical guidance and extension services together with extending the seedling production on Santo Island have a high priority, too. The legal and institutional design of a Registry has to be developed over the next two years anticipating forthcoming decisions to be taken by the COP and the Government of Vanuatu. Contractual arrangements on carbon rights, incentive mechanisms and benefit sharing can be defined once the registry has been established. The priorities in value chain development depend on the tree species. While sandalwood's value chain has been fully assessed, whitewood and Canarium require further research.

5. Conclusions and Recommendations

The assessment of available remote sensing data indicates, that there is almost no potential for activities reducing deforestation within the CCA/REDD site. Reducing forest degradation by eliminating invasive weeds might show some potential for emission reductions and removals, but requires further research to assess the management options and their carbon dynamics.

The community areas of Penaoru and Petawata show a potential of 664 ha for enhancing forest carbon stocks activities. However, 65% of the potential is located outside the CCA/REDD site in areas around the villages. Only one third of the potential (219 ha) relates to areas larger than 1ha. Given the spatial distribution of potential sites, the original concept of a combined CCA-REDD site has to be modified. The CCA area can be maintained as established, but its management plan should allow for A/R activities considering that some Sandalwood stands have already been established inside. In case the REDD+ activities will only encompass A/R activities, the boundaries of the REDD+ sites will become obsolete and can be replaced by the community boundaries. Within this scenario, Penaoru, Petawata and other communities will register their A/R activities and sites in a (sub)national registry applying an approved protocol. The registry will operate a spatial database of all EFCS activities, and measure, report, and verify their GHG removals. In its mature state, the registry will account for all eligible REDD+ activities across islands and community territories. Early movers willing to participate in piloting REDD+ on Santo Island would have to register their activities based on consolidated community territories.

The estimated GHG removal potential of the three species (Sandalwood, Whitewood, Canarium) promoted by the Government of Vanuatu ranges from 10 to 185 tC/ha over a 20 years growing period. While growth and yield projections are available for Whitewood, Sandalwood and Canarium require further research. As the tree species differ in their potential to generate carbon, timber, and non-timber benefits, the choice of the appropriate system depends on site specific conditions and preferences of the landowners. To assess the EFCS potential of Santo Island and to identify the sites with the highest EFCS potential a multi-criteria analysis should be conducted for Santo Island. The results of such an analysis could guide the government in setting up an EFCS target (in terms of areas and GHG removals) and in stimulating early action in other communities.

Technical guidance, extension services, enhancement of seedling production and value chain development are key for developing Vanuatu's EFCS potential. To kick-start activities on Santo Island, protocols and guidance for seedling production and planting will have to be developed, first, while setting up the registry. Readiness finance should be used to provide incentive to early movers, e.g. by reducing their transaction costs by improving market access, by improving their silvicultural practices, and by increasing their scale of production.

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Acronyms

A/R	Afforestation and reforestation
AWG-KP	Ad-hoc Working Group on Further Commitments of Annex I Parties under the Kyoto-Protocol
AWG-LCA	Ad-hoc Working Group on Long-term Cooperative Action
BAU	Business as usual scenario
BEF	Biomass Expansion Factor
CDM	Clean Development Mechanism
COP	Conference of the Parties
DBH	Diameter at Breast height
DoF	Vanuatu Department of Forestry
ERR	Emission reductions and removals
EFCS	Enhancement of forest carbon stocks
GHG	Greenhouse gases
GOFC-GOLD	Global Observation of Forest and Land Cover Dynamics
IPCC	Intergovernmental Panel on Climate Change
JNR	Jurisdictional and Nested REDD+
JNRI	Jurisdictional and Nested REDD+ Initiative
LULUCF	Land Use, Land-Use Change, and Forestry
MMU	Minimum mapping unit
MRV	Measurement, reporting, and verification
NAMA	Nationally Appropriate Mitigation Action
REDD+	Reducing emissions form deforestation, forest degradation, conservation, sustainable management of forests and enhancement of carbon stocks
RS	Remote sensing
SBSTA	Subsidiary Body on Scientific and Technological Advice
UNFCCC	United Nations Framework Convention on Climate Change
VANRIS	Vanuatu Resources Information System
VCS	Verified Carbon Standard