ECOSYSTEM BASED ADAPTATION IN WAINIKELI DISTRICT, TAVEUNI, AS PART OF THE PACIFIC ECOSYSTEM BASED ADAPTATION TO CLIMATE CHANGE (PEBACC) PROJECT.

A lookout from Lavena coast of the pristine Ravilevu Nature Reserve

IMPLEMENTATION REPORT
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CONSERVATION INTERNATIONAL

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1.0 EXECUTIVE SUMMARY

Ecosystem-based adaptation (EbA) is the use of biodiversity and ecosystem services as part of a strategy to help people adapt to climate change. Taveuni was selected as one of the sites for implementation of the Pacific Ecosystem-based Adaptation (EbA) to Climate Change (PEBACC) project that aim to promote the use of EbA, as low cost response measures for building climate resilience in the Pacific[1]. EbA provides co-benefits such as clean water and food for communities, risk reduction options and benefits, and other services crucial for livelihoods and human well-being[2]. Some examples of EbA include the conservation of mangroves to protect people against storms, the reforestation of hillsides and riparian zone to prevent landslides under extreme rainfall events, and the use of shade trees in coffee plantations to maintain production under rising temperatures[3]

The EbA targets for the Wainikeli district are to plant trees that will help to restore the degraded forest margins, the degraded riparian systems, the degraded coastal systems as well to establish three agroforestry models and three community woodlots. A total of **fourteen (14) hectares** of forests were established with the community that consists of five hectares established on upland abandoned agriculture land, three hectares of riparian and another three hectares of coastal areas were restored. Three agroforestry models were also established.

The Google Earth Engine code on the Wainikeli sites was able to produce some impact indicator results that basically shows the area and calculate the CO_2 removal/sequestration rate coefficient for this type of restoration as well as the ton of CO_2 equivalent that would be sequestered per year given the size of the site and type of restoration. The coefficient for agroforestry systems in Fiji, 13.9 tCO_2 ha^{-1} per year, and the coefficient for miscellaneous broadleaf plants in plantations and woodlots in Fiji, 25.3 tCO_2 ha^{-1} per year were used and multiplied by the area to give the volume of carbon that are sequestered from the planted sites. Multiplying the calculated coefficient values by the intervention area of each site yielded the mass of carbon sequestered per year. From the total sampled area of 1.12 hectares, the CO_2 sequestered value was calculated to be 25.77 tCO_2 equivalent per annum.

One shortfall in the achievement of the proposed Wainikeli restoration target, was the inability to establish community woodlots particularly for the fast-growing exotic timber species in *Tectona grandis* (Teak) and *Swietenia macrophylla* (Mahogany). Lack of coordinated effort for the relevant seedlings as well as the outsourcing of the seeds was the main contributing factors besides others, particularly the risk that Mahogany species may become invasive.

Active community engagement and participation is an area that needs a lot of strengthening particularly the need to support communication and coordination between the key players involved. One important strategy that is recommended for consideration in the future, when engaging with rural communities, is the need to support tangible, community-oriented incentives to help stimulate interests, active engagement, and long-term commitment particularly during the filed implementation phase. A better way of managing incentives is to develop small scale community- based incentive packages that meet a much broader beneficiaries in the community, such as alternative livelihood

[1] SPREP 2018. Planning for ecosystem-based adaptation in Taveuni, Fiji. A synthesis report by the Secretariat of the Pacific Regional Environment Programme, Apia, Samoa. 16 pp.

[2] Baig, S. P., Rizvi, A., Josella, M., Palanca-Tan, R. 2015. Cost and Benefits of Ecosystem Based Adaptation: The Case of the Philippines. Gland, Switzerland: IUCN. viii + 32pp.

[3] Camila I. Donatti et al, 2019; Indicators to measure the climate change adaptation outcomes of ecosystem-based adaptation, Climatic Change https://doi.org/10.1007/s10584-019-02565-9

activities on Bee Keeping and alternative handicraft opportunities for village bound visitors, to entice an all-inclusive interest to engage, instead of direct payments to individuals.

2.0 BACKGROUND

Taveuni is the third largest island of the Fiji archipelago and is usually known as the garden island of Fiji with its thriving agriculture contribution to the national economy. During the colonial government, copra *Cocos nucifera* has been the dominant trading commodity from Taveuni which was replaced by kava *Piper methysticum* production after independence and replaced by taro - *Colocasia esculenta*, following the taro leaf blight incidence in Samoa in 1993. Taveuni became the main supplier of Taro overseas, especially to New Zealand and Australian markets[4].

The most challenging issues from the intensive land use practices has been the reduction of the soil fertility as well as low level of water resources because of increasing forest removal, the detrimental effect of using synthetic agriculture inputs and the increasing level of siltation that continue to affect marine ecosystem. Moreover, the increasing demand from the export market eventually entice the village-based farmers to transit from the traditional shifting multiple crop mix farming system to the more intensive mono cropping and short rotational system. In the Melanesian islands, farmers traditionally farmed a plot of land for a few seasons and then allowed the forest to grow back. The resulting 'bush fallow' restored soil organic matter and other vital nutrients. But commercial farming has meant rapid changes in farming practices, with the focus on supplying the markets in the short term rather than longer term sustainability. Farmers tend to plant the same crop, season after season, without realising that vital nutrients are being depleted with disastrous consequences (Moorhead,)[5] . Hence, as a result of frequent cultivation with short rotations and increasing use of agro-chemical to maintain high yield per land area, the soil nutrients are lost as insufficient time were given for the soil to recover its optimum nutrient level (Panapasa, 2012)[6].

With a long history of participating in the capitalist plantation economy in the garden island of Fiji, the i'Taukei communities are also engaged in cash crop ventures using their communally owned land with intensive mono cropping farming practices that virtually degrade and deforest the land more than the traditional farming practices. Though the integrated cropping systems are still commonly seen, a lot of deforestation are also happening largely in the upper elevation away from the village and close to and even beyond the blue line or green belt boundary of the forest reserve. Most of this parcel of lands are left abandoned due to the poor fertility state of the soil and are now intensively covered by invasive weeds particularly the *Merremia peltata* or "wa damu" in i'Taukei language and "viliyawa" in the local dialect. Merremia is noted as one of the dominant weed in disturbed forest in Western Polynesia, Solomon Islands and Indonesia (Whistler, 1983)[7].

The absorbency of the volcanic soil in Taveuni makes it more vulnerable to siltation and accelerated water run-off, that can affect the island hydrological status and reduce agriculture productivities and human well-being. A hall-mark decision during the colonial government in 1914 saw the declaration of the Taveuni forest reserves with a blue belt boundary. This was seen to be the cornerstone that

[4] Taveuni Still Top Dalo Supply, Fiji News, 18th June, 2014, https://fijisun.com.fj/2014/06/18/taveuni-still-tops-dalo-supply/

[5] Anne Moorhead, 2015: Resolving the soil Paradox; Improving soil health in support of sustainable development in the Pacific. Issue Two 2015 PARTNERS In Research for Development, www.aciar.gov.au

[6] Panapasa, G. Low soil fertility a challenge. The Fiji Times, September 24, 2012. http://www.fijitimes.com/story.aspx?id=212667.

[7] Whistler WA, 1983: Weed handbook of Western Polynesia. Schriftenreihe der Deutschen Gesellschaft fnr Technische Zusammenarbeit, 157 pp

maintain the pristine landscape of Taveuni with a productive agriculture system for generation. However, intensive shorter rotational mono-cropping agriculture practices have drastically affected the fertility and productivity of agriculture system in the island that is now demanding an ecosystem-based intervention.

These increasing sensitivity of the island system in the Pacific to environmental, social, and economic change has prompted the need to seek and implement strategies that strengthen communities through interventions that buffer the supply and diversity of ecosystem services. The Secretariat of the Pacific Regional Environment Programme (SPREP) with funding from the German Federal Ministry of Environment (BMUB) International Climate Change Initiative (IKI), has initiated a four-phase project to seek and implement a strategy to strengthen communities through ecosystem-based adaptation (EbA) and management activities. The Pacific Ecosystem-based Adaptation to Climate Change project (PEBACC) is focused to identify, prioritize and implement EbA strategies to meet critical needs in three countries (Fiji, Vanuatu and Solomon Islands) at three different major scales: a national, provincial and a focused island scale.

The key objective of the PEBACC project is to identify what climate change factors and what suite of other circumstantial factors are limiting socio-economic resilience, particularly as it pertains to ecosystem services and the resilience of these services through time, and to prescribe a range of EbA actions that can broaden the range of possibilities for communities through the enhancement of ecosystem services.

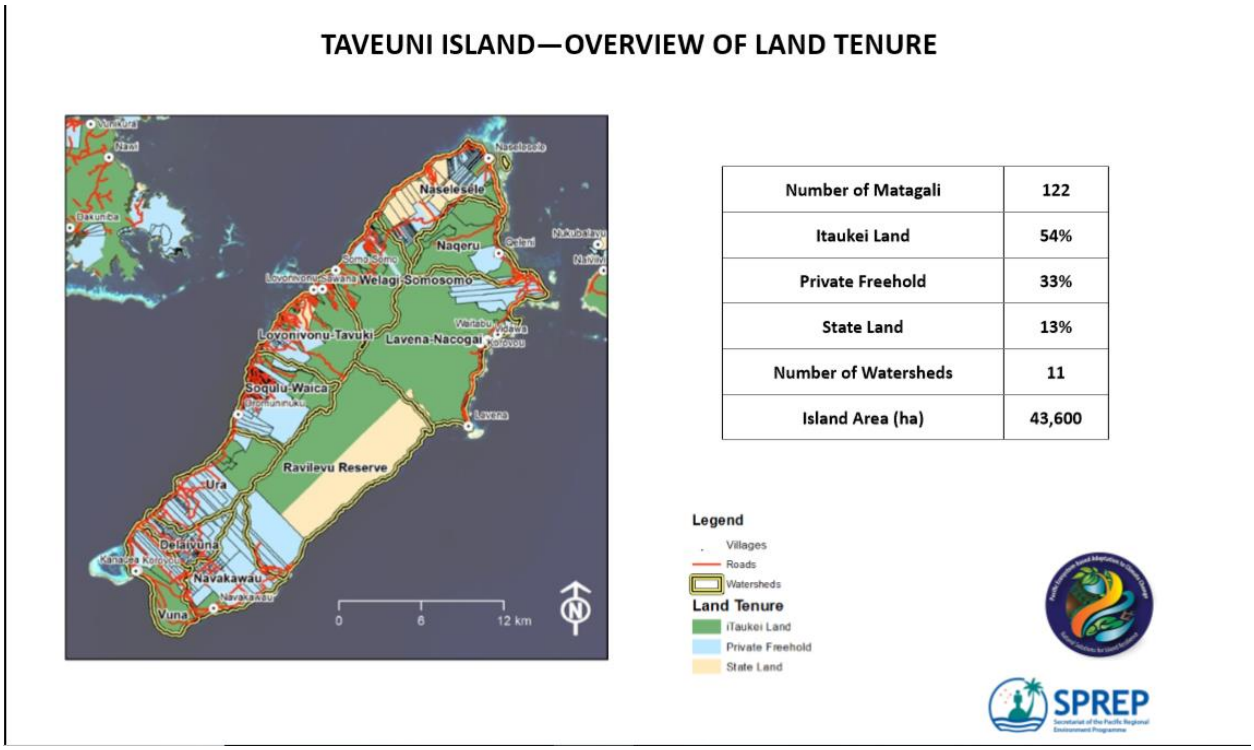


Figure 1: Land tenure arrangement in Taveuni (extracted from the Taveuni EbA Option Assessment 2017 Report)

3.0 INTRODUCTION

Conservation International is engaged as one of the three implementing partners to lead the Ecosystem based Adaptation work in Wainikeli District, Taveuni under the third project phase for the SPREP-PEBACC project. The other two implement agencies are the Secretariat of the Pacific Community (SPC) to cover Cakaudrove District and Scientific Forest Services to cover Vuna District.

Agriculture has been the backbone of Fiji's economy and Taveuni is considered as one of the main production sources because of its abundantly rich volcanic soil type. In the more recent years, Taveuni has been the major supplier of taro that are exported to the New Zealand market, following the leaf blight problem that destroy the Taro industry in Western Samoa. The expanding taro economy also attracted a lot of farmers from outside, mostly the displaced sugar cane farmers as well as traditional farmers from other nearby islands, which push lots of pressure on the soil productive capacity.

The impact to the environment, particularly the implication on the important environmental services such as the decreasing level of water, declining in soil fertility from short rotation fallow period, increasing issues relating to synthetic agriculture inputs, increasing sedimentation rate and impact to the coral reefs and the incursion of invasive weeds significant affects the sustainable livelihood of the local people. Ecosystem services that are essential for human well-being, such as clean water provisioning, soil erosion control, or the pollination of crops, depend on ecosystem functions that are controlled by the species living in an ecosystem[8] were badly affected. The effects of land cover change from native forest to fallow grasslands, coconut plantations, kava and eventually taro cash crops have contributed to fundamental changes in the soil quality and fertility as well as affecting water sources, species compositions and the incursion of invasive weeds. Forest conversion to agriculture, the use of synthetic chemicals as well as successive cultivation over the past years is affecting the productivity as well as the ecosystems and its important services.

The PEBACC project in partnership with key stakeholders in Taveuni have identify the major watersheds as well as the set of restoration priorities to undertake, particularly the restoration of degraded terrestrial such as the abandoned agriculture land, degraded riparian zone and deforested coastal margin as specified below:

- Forest health and extent to expand native forest into abandoned agricultural lands in high elevations
- Soil productivity through change of agricultural and agroforestry practices to create diverse agroecological systems
- Riparian function to attenuate terrestrial runoff to the marine environment
- Biodiversity through expanded forest conservation, native forest restoration, reforestation, decrease in fragmentation, invasive species monitoring, and diversity in agricultural systems
- Storm surge protection through enhancement of coastal ecosystems, where appropriate, including expansion of mangroves
- Freshwater sustainability through protection of high elevation forests and expansion to slow runoff and increase cloud and rainwater infiltration to groundwater supply
- Sustained food supply through protection of marine resources, habitat improvement, potentials for aquaculture, and diversity of crops
- Sustained income and independence with shifting reliance on income from cash crops to diversified investment that enhance ecosystems

The restoration work in Wainikeli district covers three watersheds. Naselesele watershed at the northern tip of Taveuni is where a lot of intensive agriculture farming is happening in the upper water catchment higher land plateau. It is also where the issue of water problem is prevalent. Naqeru watershed at the north eastern tip of the island has a lot of remnant abandon agriculture land that intrude over the blue line boundary. This portion of the Taveuni forest reserve were developed

[8] Leidinger et al, 2017; Historical & recent land use affects ecosystem functions in subtropical grasslands in Brazil, Ecosphere, Vol 8, Issue12.

through the iTaukei Land trust Board for agriculture subdivision that fail to recognize the existing forest reserve declaration under the Ministry of Forestry. There has also been some issue on water supply problem mentioned which was relatively marginal. Nacogai-Lavena watershed on the eastern port of Taveuni is well forested, where the level of deforestation and degradation is comparatively low, yet some rolling mountain bear visible signs of past clearance for intensive commercial agriculture production, totally tree less with incursion of *Merremia peltate* cover.

The scale will be relatively small and challenging that demand smarter interventions, strong partnership as well as efficient communication and coordination with key stakeholders particularly with local champions such as the Yaubula Management Support Team (YMST) and key government agencies like the Ministry of Agriculture, Ministry of Forestry and the Ministry of I'Taukei Affairs. The approach is to strengthen the engagement with the watershed communities as early as possible through community planning, site selection, seed and seedling production, land preparation and silviculture management practices and to support the communities in the establishing of the model plantation within the targeted ecosystem. Eventually, the theory of change anticipate that the local community will be empowered with the appropriate information to continue the expansion and oversee the long-term management of the established plots and implement sustainable resource management practices into the future.

4.0 IMPLEMENTATION APPROACH

4.1 Stakeholder Engagement

A reconnaissance survey of the Wainikeli District was carried out on the 22nd – 27th of October2018, initially to allow Conservation International to have a broader awareness on the land-based development and environment issues that affects the District. It offers the opportunity to consult with key stakeholders including community members, implementing partners and government agencies on the ground and to present our traditional protocol to the chief and people of Wainikeli. Part of the initial consultation target was to appraise the general understanding of the community representatives with regards to the SPREP-PEBACC project and to gain what sort of expectation the local people have and how they can actively participate. A community awareness and participatory planning workshop was carried out to help in identifying the key environmental service issues that have been affected badly over the years in Wainikeli due to unsustainable land use practices.

Participatory planning was also considered as crucial because it helps in the formulation of a range of restoration interventions or options that can be prioritised and implemented during this third phase of the PEBACC project. Participatory approach to land use planning is therefore needed, because it can: (a) mesh and harmonize several planning instruments from the national to the local level; (b) build the capacity of stakeholders to adapt and respond to change, (c) validate and incorporate local knowledge and perspectives into the planning process; and (d) generate greater commitment towards implementation among governmental agencies, the private sector, communities and civil society[9].

[9] FAO, 2013; Participatory Land Use Planning Workshop Proceedings, Georgetown, Guyana 17-18 June, Land and Water Division Working Paper 5.

Figure 2: Wainikeli Community Participatory Planning Workshop at Lavena village and intensive taro farm

Table 1: Major Issues from the Community Participatory Planning Workshop

Issues Raised	Watershed Affected	Identified Causes	Planned Intervention
Poor water quality and low pressure	Naselesele	• Weak governance on the protection of the water sources • Agriculture clearing on the upper catchment	• Clearly demarcate and enforce protection of water sources • Ban agriculture in the upper catchment area
Low interest/ incentive to plant trees.	All three watersheds	• Local perceptions that trees will grow naturally • Lack of foresight • District are well forested already • Short term rotation is more attractive	• Encourage community nursery and community planting • Raise awareness on importance of trees for ecosystem services and food security
Government incentives, be considered carefully	All three watersheds	• Export driven policy causes negative impact on forests and land.	• Ban the use of chemicals and go organic
Community nursery production	All three watershed	• Lack of seedlings at the community level hinders tree planting	• Undertake basic tree seedling production and nursery management practices • Establish simple community-based nursery

4.1.1 Allocation of Tasks

One important outcome from the community participatory planning workshop saw the allocation of responsibility to local stakeholder group that are well positioned to support the restoration activities on the ground, given the expected impact (Table 2). Restoration effort along the degraded water catchment area and the coastal zone is allocated to the village committee or "bose vakoro" forum since the impact of the restoration will supply the provisions of important environmental goods and services such as water as well as building resilience from sea storm surge. Likewise, community members agree that the implementation of the agroforestry model is well placed to willing farmers who are eager to integrate trees in their existing farms as model to other local farmers. Riparian restoration is allocated to the landowning units or lease holders along the water ways.

Table 2: Community agreement on the allocation of task

Type of Interventions	Who is responsible	Prerequisite	Key challenge
• Restoration on the upper water catchment area • Restoration of the coastal zone	Village council through the village headman and YMST rep	Village council endorsement as part of the environmental activities	• Lack of incentive to participate. • Clarity of purpose/ advantages to the villagers.
• Restoration of agriculture farmland (agroforestry model)	Active individual farmers who showed the interest	• Readily available farm model site • Identify tree species to model and why? • Learning from the local practice	• Availability of the tree species of choice • Clarity on the appropriate model to adopt
• Restoration of riparian zone	Landowning clan or leaseholder	• Clearly eroding of riverbank	• Readily available riparian species of choice

4.1.2 Strengthening partnership with government agencies

Coordinating the support from relevant government department will be significantly important to be able to work in partnership as well as aligning the project objectives and activities in harmony with the priority policy of government. Three particular relevant agencies are the Ministry of Forestry with the "reforestation of degraded forest and the one-million tree initiative", the Ministry of Agriculture "climate smart agriculture and sustainable land management", and the Ministry of iTaukei Affairs "national i'taukei resource owners committee and the yaubula management support team initiative". Aligning the range of EbA activities with the current government initiatives will ensure the long-term sustainability, cohesion, and continuity of the effort through additional government supported objectives which will be an ideal exit strategy from the project perspective.

The implementing agency in three occasions met separately with the three key government agencies to discuss in detail the planned intervention and the opportunity to work in partnership in the areas of common interest. A lot of verbal commitment for partnership support were given, however in most cases, the agencies were heavily engaged with internal priorities and commitment with limited space to be engaged with the project.

4.1.3 Strengthening of local support team

Strong leadership and effective coordination of the local support will be an important catalyst when it comes to community development. One of the first initiative implemented by CI saw the selection of the respective village based Yaubula Management Support Team (YMST) members (Table 3) that will eventually lead the implementation of the EbA interventions at their respective watersheds. Their voluntary role is to support, coordinate and communicate with the local villagers and help in relaying the activities and timeline for field implementation. This village based working committee champions also coordinate the necessary support needed and become a conduit at the village level as well as the channel of communication to the village headman and village meeting and from the village to the project coordinator and to the district, project forum and even up to the provincial forum where necessary.

A follow up meeting was organized on the 28th of February 2019 to review the progress of the work and to gather the views of the working group regarding the implementation of some of the activities on the ground. It was obvious that some village representatives were not clear with the activities that will be implemented on their land, particularly on how the various activities will be coordinated, thus the resolution from the working committee meeting was to support transport costs for village visitation by the Wainikeli watershed coordinator and the district representative "mata-ni-tikina" to clarify the planned EbA activities that will be implemented in each villages and to re-emphasise the needed support at the local village level.

Table 3: Members of the Wainikeli Working Committee (YMST)

Name	Watershed	Remarks
Tuwani Jone	Naselesele	Chiefly Rep
Sereli Tupou	Qeleni	
Mikaele Tawake	Qeleni	Teitei Taveuni Rep
Rajen	Qeleni	Indo-Fijian Rep
Paul Waqaliti	Nacogai-Lavena	
Tai Tusi	Nacogai-Lavena	
Petero Waisea	Nacogai-Lavena	
Sipiriano Qeteqete	Nacogai-Lavena	Wainikeli Watershed Coordinator

4.1.4 Community Capacity Building

Empowering the local people is an important aspect of the community development that encourage active engagement and ownership. A package of basic practical training and demonstration touches on community nursery and seedling production and silviculture management training on tree planting and management were covered. The purpose of the nursery training was to support the acceleration of seedling sources that can be used for the restoration work, using the readily available local seed sources and culminates in the establishment of three small scale nurseries as detailed in section 4.2.1.2. Basic community training on silviculture management helps to support tree planting and tree maintenance knowledge. This short practical training was adequate to support the engagement of the local people in the field work given the short time and the limited finance to undertake the restoration work, even when only few people are involved. Large scale and long-term restoration work may need a comprehensive capacity development initiative.

Capacity development initiatives can more effectively support stakeholders to address the complex nature of forest restoration, if they include the following four components: (a) activities tailored to stakeholder needs and context, (b) knowledge and applied experience from diverse sources and disciplines, (c) skill sets for selecting among a suite of restoration interventions, and (d) inclusion of multiple subjects and skill sets (e.g., social, financial, legal, etc.) in addition to technical or ecological themes.[10] This is particularly relevant since the project is implementing a suite of EbA interventions with different outcomes, therefore require different approaches altogether. Agroforestry model for example demands innovative thinking on tree and crop combination, arrangement and spacing that ensure complementarity for shades and nutrients intake as well as diversified commodities, later.

[10] Gillian Bloomfield et al, 2019; Strategic Insights for Capacity Development on Forest Restoration, Tropical Conservation Science. journals.sagepub.com/doi/full/10.1177/1940082919887589.

4.2 Restoration Work

4.2.1 Tree seedling production

Seedlings are the foundation for many terrestrial ecosystems and are critical consideration and investment for implementing forest and landscape restoration programs[11]. The pledge by government to plant thirty million trees in fifteen years, necessitates the scaling up of tree seedling productions of various species for various needs within different forest ecoregions. Insufficient plant quantities or poor-quality plants result in unsuccessful out planting programs. Such failures have considerable economic and environmental consequences and will result in an inability to meet restoration goals. Tree seedling was one of the concerning issues raised during the coordination of support meeting in Somosomo, Taveuni, following the engagement of the three implementing partners. An important resolution from the meeting was to establish a centralized nursery facility at the Mua Research Station that will be managed by a dedicated nursery man seconded from the Ministry of Forestry. This was considered as an easy way forward because of the established facilities like water system, land space as well as general security and safeguards. However, the process involved in engaging the Ministry of Forestry staff to construct the nursery and start the seedling productions did not materialize, causing considerable delays to the field restoration activities.

4.2.1.1 Centralized nursery

The centralized nursery at the Agriculture Station in Mua did took a while to go up due to the comprehensively longer process and procedure to follow for engaging a full time nursery officer through the Ministry of Forestry and this basically delay seedling production's lead time. This considerable delay in seedling availability makes it even more challenging to effectively plan, mobilize the community and coordination the support that may be needed for the restoration work. CI seedling scoping visit to Taveuni during the last week of February 2019, recorded some seed germination work that is happening on the site but without the nursery structure still. Tree seedlings from the central nursery were made available for the Wainikeli District during our August 2019 trip and the stock were rationalized among the three districts due to limiting seedling stock. The demanding rush for seedlings on the other hand, affects the quality of seedlings before planting, as most of the seedlings that were moved for planting do not strictly follow the hardening process which was important to increase plant durability and resistance to stress by gradually acclimating plants to field conditions before out planting. A hardy seedling stock can withstand the handling, transporting stress as well as the environmental and biological competitors.

Figure 3: SPREP-PEBACC nursery established at Mua Research Station, Taveuni

[11] Hasse Diane and David Anthony, 2017; Developing and supporting quality nursery facilities and staff are necessary to meet global forest and landscape restoration needs, Reforesta Scientific Society, Vol 4: 69-93.

4.2.1.2 Community Nursery

Following the nursery training program in November 2019, for interested villages in the district, support was provided in terms of shades, potting bags, and seeds for the development of three community-based nurseries. The nurseries were established at Mika's place in Navakacoa, Turaga ni koro's residence in Korovou village and in District representative residence in Lavena village. All seedlings that were produced from the three community nurseries planted in August to supplement the seedlings sourced from the central nursery station. Unfortunately, there has been a lot of disunity seen in the development of the community nursery. Only one household was seen to be engaged with the nursery work and it is likely that there are existing communication barriers and that the community may have a totally different perceptions and viewpoint altogether regarding the project.

Figure 4: Mika's community-based nursery in Navakacoa and the Green Fiji Ltd Nursery near Lovonivonu

4.2.1.3 Private Nurseries

Part of the tree seedling mobilization strategy was to do a scoping work on the available seedlings that are stocked with private nursery in Taveuni that can be bought out to support the restoration work. This was undertaken after verbal agreement was assured by the Ministry of Forestry of the opportunity to use the RDF fund for the purchasing of the tree seedlings. The most promising nursery visited was the Green Fiji Nursery a privately owned nursery at Lovonivonu. The seedlings were quite vigorous and healthy, in a very best condition for planting and at a very reasonable costs if purchased in bulk. The purchase did not fall through because of the new tender policy requirement for any nursery suppliers to the Ministry of Forestry as directed through the Ministry for Economy new procurement policy.

Figure 5: Seedlings distribution from the central nursery to the community

4.2.2 Community restoration

Mobilizing of the local community are normally arranged through the village YMST representatives or through the village head man (turaga ni koro) in their absence, particularly when planting is done on the degraded catchment sites. The basic land preparation activities include polling work that will determine line direction, line spacing and line clearing too facilitate a through way for transferring seedlings along. The standard spacing of six meters by six meters or 287 trees per hectare were used given the quantity of seedlings available. Ideally for degraded landscape of abandoned farming land, intensive tree planting of fast-growing tree species would have been appropriate to encourage quick canopy cover. Weeding maintenance are scheduled at three monthly intervals, which is particularly important because of the risk of smothering from the aggressively invasive Merremia weeds, given the prevailing microclimate and prime soil condition for invasive species.

Capturing of the area planted were also done using the normal Global Positional System (GPS) and the captured coordinates were latter on used for the development of the impact indicator index for the EbA interventions done in the Wainikeli District by CI as covered in section 4.3.2 below, as well as for geo-referencing in GIS data layers, which are useful in designing the monitoring protocol.

Because restoration is a long-term process, further tending may be needed such as thinning; this will need to be scheduled and noted in project documentation. In addition, it is important to document how, when and where interventions were conducted. Monitoring is an integral part of project implementation and the reasons for monitoring are for documenting, reporting, learning, adapting and communicating. Specifically, monitoring is needed to gauge short- and long-term success; to determine if, and when further intervention is needed; and to identify unintended consequences that threaten the sustainability of the restoration project[12].

Figure 6: A young Vesi *Intisia bijuga* and Dakua *Araucaria macrophyla* saplings out planted in the field

4.2.2.1 Restoration of abandoned upland agriculture land

Majority of the area that needed to be restored are considered as abandoned agriculture land that are currently tree less and mostly covered with invasive Merremia weeds. This are highly degraded sites that have been used for intensive crop land over the years and therefore with very low fertility that will need a lot of soil improvement and recuperation work as well as time to recover before it can be used again. Trees are therefore important to bring back the microclimatic ecosystem, infiltration

[12] Stanturf, John; Mansourian, Stephanie; Kleine, Michael; eds. 2017. Implementing Forest Landscape Restoration, A Practitioner 's Guide. International Union of Forest Research Organizations, Special Programme for Development of Capacities (IUFRO-SPDC). Vienna, Austria. 128 p.

and reticulation and interaction with important biotic agents including birds, water and carbon influxes. Most degraded upper landscapes are important connected forest catchment areas that not only need to be restored through tree planting but must also to be designated protected areas and restricted from any form of forest clearings with strong governance and good management arrangement.

One of the positive lessons learned from the Naselesele watershed is the agreed moratorium by the local community to cease all agriculture clearing in the upland water catchment area and to remove all farmers away from the upland catchment site by 2020. This is the community long term vision to reclaim and restore their highly vulnerable water catchment areas in perpetuity.

Figure 7: Typically degraded upland forests from agriculture clearance

4.2.2.2 Riparian Restoration

Establishing a riparian planting may sound easy to do but can be quite challenging. It will surely need a lot of understanding of the hydrological dynamics, soil types in terms erodibility and awareness of what has been working on site. Seedling survival and growth are often poor. Competition from weeds can be high. Animal damage is common. Soil texture on a site can vary from coarse sand to dense clay[13]. Planting sites may flood frequently, while open grazing which is common in rural communities, can be damaging to young saplings.

Riparian area in Wainikeli are overgrown with para grasses that are already providing cover to the soil surface and reducing siltation or soil erosion, however the restoration effort aim to complement the existing system by planting vetiver *Chrysopogon zizanioides*, and tree species like Vesi, *Intisia bijuga* and Ivi, *Inocarpus fagifer* which are common riparian deep rooted species. The gravest challenge as common in restoration through tree planting will be the management of weeds that can easily smoother the candidate plants in no time if not maintained. Another critical challenge will be the impact of flooding since this east side of Taveuni is flood prone, so the impact of flooding in the future may need frequent observations.

[13] Brad Withrow et al, 2011; A guide to riparian tree and shrub planting, Oregon State University

Figure 8: Riparian restoration using the common vetiver grass

4.2.2.3 Agroforestry Model

Agroforestry in Taveuni and in Fiji is not new, as this has been practiced for generation, however pressure from large scale mono cropping system during the taro production boom period from 1990's has shifted the local thinking from agro-forestry and multi cropping mix to intensive mono-cropping. Even with the drive for economic prosperity as the main underlining factors of mono cropping practices, the traditional mix cropping, multi layered crop and tree species is still very much practiced in most subsistence farming settings.

The most common agroforestry system in Taveuni for generations now is the coconut based agro-cropping system[14] and for soil fertility improvement, the most common trees used are Drala - *Erythrina variegata*, in a more diverse agroforestry tree and crop mixture. Agroforestry, like riparian restoration sounds familiar and easy, however it still require good observation, thinking, and learning to ensure the adoption of a workable model that helps create additional value to the wealth of practical knowledge that are existing already in the community.

One drawback realized was the need to critically introduce important species to support the agroforestry mix particularly those that can improve soil fertility such as Drala, Koka- *Bischofia javanica* and macuna beans *Mucuna pruriens* which has been introduced earlier in Taveuni through some past soil improvement project[15]. Another issue noted from partners and the coordinator on the ground was the change in the agroforestry site from the original plan, lack of transparency in selecting of farmers, and lack of baseline information on the farm chosen that indicates that a lot more learning, sharing of information and consultation is necessary, even during the implementation phase.

[14] Edward Chan and Craig R Elevitch, 2006; Cocos nucifera (coconut)- Species Profiles for Pacific Island Agroforestry, Ver 2.1, www.traditionaltree.org

[15] Pacific Agriculture Policy Project, Healthy soils to promote climate change food security in the Pacific, http://www.pacificfarmers.com/wp-content/uploads/2015/11/Pacific-Soil-Learning-Exchange-Booklet.pdf

Figure 9: Common traditional agroforestry practices in the Pacific.

4.2.2.4 Coastal Restoration

An important component of the EbA intervention is the restoration of the coastal areas. This is important since most of the villages, hotels and centres are sporadically located along the coast shoreline and therefore will likely faceup to detrimental climate related problems such as coastal inundation from sea level rise, salt spray and strong tidal surge. The Wainikeli district coastline is relatively stable and well sheltered from the negative impacts of strong wind, waves and currents that can easily move the unconsolidated sand and soils in the coastal area and resulting in rapid changes in the position of shoreline[16]. Another advantage is the tons of readily available seed and seedling sources that can be used to restore the degraded coastline. Coastal restoration through tree planting will build a frontier that can dampen and support community resilience from the impact of climate change to coastal habitats. The key species that were used for coastal restoration includes Tavola-*Terminalia catappa* (Tavola), *Inorcapus fagiferus* (Ivi), *Intsia bijuga* (Vesi), *Santalum yasi* and *Calophyllum inophylum* (Dilo).

Figure 10: Touring student groups took part in coastal restoration at Lavena and part of the Lavena coastal view.

[16] Prasetya G, The role of coastal forests and trees in combating coastal erosion-Regional Technical Workshop 28th-31st August 2006, Khaolak, Thailand, http://www.fao.org/forestry/11250-057198fb870df658f49cf6a16c8702d9b.pdf

4.3.0 Ecosystem Based Adaptation Results

4.3.1 Trees planting output

A total of 3,894 mixture of timber, fruits and coastal seedlings were distributed and planted at the 10 community selected sites, within Wainikeli district (Table 4). The total planting area covers approximately 14 hectares, with small patches sporadically distributed to cover the four major thematic areas viz. degraded forest (abandoned agriculture land), riparian sites, coastal sites and agroforestry sites (Figure 11). Restoration of degraded forests were done on one site at Lavena, Vidawa, Vidawa Qali settlement, Waitabu, Qeleni and Naselesele. Agroforestry models was established at Vila Maria settlement in Vidawa and at Naselesele. Riparian restoration was established in Wai and along the Tavoro eco-tourism site, while coastal restoration was established in Lavena and Navakacoa.

Detail information for the individual sites were captured as Planting Site Information Card and provided as references for any future follow up maintenance and monitoring (Annex I). The basic information that includes the site description, planting date, species compositions, plant spacing, maintenance record, survival percentage, beating up record, as well as the geo-reference coordinates are provided. It will be good if such work will continue to be supported and even follow up in the future to ensure good growth as well as protected from other development projects that may come on board to the community in the future. This basic information will be useful for ongoing maintenance, field monitoring and future learning. The successful effort in the community was also highlighted and shared in the local paper (Annex II).

Table 4: Record of seedlings by species that were distributed and planted at the listed sites

COMMUNITY	WAI	KOROVOU	QELENI	QELENI-NAVAKACOA	VIDAWA (QALI SETTLEMENT)	VIDAWA (ECO-TOURISM SITE-QALI)	VIDAWA (VILLA MARIA SETTLEMENT)	NASELESELE	LAVENA	WAITABU	TOTAL per SPECIES
VESI (*Intsia bijuga*)	404	492	492	0	266	298	195	404	250	180	2981
YASI Sandalwood (*santalum yasi*)	0	0	30	0	26	43	20	0	10	0	129
DAKUA (*Agathis macrophylla*)	0	16	0	0	0	5	5	0	0	0	26
KAUDAMU (*Myristica spp*)	0	0	0	0	4	0	0	0	15	0	19
DAMANU (*Calophyllum vitiense*)	0	0	0	0	20	0	20	0	0	100	140
KAUNICINA (*Canarium harveyi*)	0	0	0	0	0	44	0	50	0	0	94
TAVOLA (*Terminalia catappa*)	0	50	30	0	0	0	0	0	30	0	110
MOIVI (*Cynometra insularis*)	0	0	0	0	0	0	0	0	5	0	5
DILO (*Calophyllum inophyllum*)	15	30	0	0	0	0	0	0	0	0	45
SOSAPE Soursop (*Annona muricata*)	2	15	0	0	0	5	10	0	0	0	32
VETIVER (*Chrysopogon zizanioides*)	108	0	0	0	0	0	0	0	0	0	108
IVI Tahitian chestnut, (*Inocarpus fagiferus*)	0	0	0	0	0	0	0	20	50	0	70
DOGO Mangrove *(Rhizophora stylosa)*	0	0	0	110	0	0	0	0	0	0	110
AVOCADO *(Persea Americana)*	0	0	0	0	0	0	10	15	0	0	25
TOTAL SEEDLINGS/ COMMUNITY	529	603	552	110	316	395	260	489	360	280	3894

4.3.2 Impact Indicator Outcome

Measuring changes or impact from restoration and adaptation requires long-term monitoring. This also applies to the Taveuni EbA approach that is reforesting degraded, abandoned agricultural areas to prevent soil erosion during excessive flooding under changing climatic conditions and restoring coastal habitats to defend against coastal erosion and storm surge. Because of the shorter life span of the project, Conservation International (CI) is using indicators that describe input and outputs of the project, such as the number of trees planted, hectares of wetlands rehabilitated, and number of

farmers implementing smart agriculture practices[17]. This effort is a component of a new CI strategy to measure their global impact through the following four quantitative indicators: area, carbon, socio-economic, and species protected. This process allows CI to effectively monitor conservation efforts to ensure they have the maximum possible impact on the landscape, climate change mitigation, people, and biodiversity. This strategy also allows CI to target future work more effectively by highlighting successful projects and gaps in their portfolio. The collection of data from each individual project site is crucial in this process.

To calculate impact indicators for the restoration sites in the Wainikeli District, Taveuni, we first plotted the location of each activity (Figures 11) and calculated their total area based on GPS data collected from the perimeters of each site. Then, to determine the impact and climate change mitigation potential of these sites, we calculated the carbon dioxide removal, or the annual mass of carbon removed from the atmosphere through these planting activities. Bernal et al. 2018[2] determined the rate of carbon dioxide removal from various forest landscape restoration (FLR) activities. This is presented as a series of coefficients representing the mass of CO_2 removed per year from one hectare based on the intervention type, geographical location, climatic conditions, and species of tree planted in the site. To calculate removal for our sites, we used the coefficient for agroforestry systems in Fiji, 13.9 tCO_2 ha^{-1} per year, and the coefficient for miscellaneous broadleaf plants in plantations and woodlots in Fiji, 25.3 tCO_2 ha^{-1} per year (Table 5). We multiplied this number by the area of each site to obtain the mass of carbon sequestered per year. From the total sampled area of 1.12 hectares, the CO_2 sequestered value was calculated to be 25.77 tCO_2 equivalent per annum (Table 5).

Table 5: Impact indicator projection on carbon sequestration based on the area planted

Site	Intervention	CO_2 Removal Rate (t CO2 ha -1 year)	Area (ha)	tCO2 equivalent Sequestered per year
Vidawa	Restoration	25.30	0.404	10.23
Bouma	Restoration	25.30	0.172	4.36
Qali	Restoration	13.93	0.140	1.95
Villa Maria	Agroforestry	13.93	0.083	1.15
Lavena	Coastal Res	25.30	0.187	4.73
Korovou	Riparian Res	25.30	0.132	3.34
TOTAL			**1.12**	**25.77**

Socioeconomic impact indicator from the EbA intervention can only be realized way into the future, such as an improved delivery of ecosystem services e.g. improved water source, improved food production system, enhance local capacity through social learning and sharing to the 3,000 population in Wainikeli district. The impact on species diversity can again be realized also in the future particularly on Silktail- *Lamprolia victoriae*[18], Friendly Ground Dove- *Gallicolumba stairi*, and Tree Frog - *Platymantis vitianus*, all of which are currently near threatened (NT).

Monitoring the impact beyond the life of the project requires planning, continued engagement, and long-term funding to capture the full benefits of EbA, which is not common in project funding. Benefits from EbA projects may result over years or decades after the project completion because of the long-term growth of living systems like forests or wetlands, which is a longer timeframe than other adaptation measures.

[17] Maggie Comstock, 2017: Submission to SBSTA1 from Conservation International regarding Indicators of Adaptation and Resilience, www.conservation.org/eba

[2] Bernal, B., Murray, L.T., Pearson, T.R.H., 2018. Global carbon dioxide removal rates from forest landscape restoration activities. *Carbon Balance and Management* **13(1)**, 22. https://doi.org/10.1186/s13021-018-0110-8

[18] Birdlife International (2020) Species factsheet: *Lamprolia victoriae*. Downloaded from http://www.birdlife.org

Figure 11: Map showing the location of some of the restoration sites in Wainikeli district

4.3.3 Project Terminal Review Result

The final visitation was undertaken in the Wainikeli project site toward the terminal phase for the SPREP-PEBACC work to: i) round up maintenance of weeds in the planting sites, ii) do survival counting and do beating up operation, iii) organise a terminal review workshop that focus on the actual achievements against the set targets, reflection on some of the lessons learned and discuss some possible scenario in the future. An 'after action review'[19] tool (Figure 12) was implemented during the terminal workshop to account the planting achievements, reflect on the challenges and record lessons and knowledge arising out of the project by involving the community stakeholders in the brainstorming and discussion and the results are tabulated in Table 6.

One of the major draw-back observed was the inability of the project to established the targeted community woodlots which was anticipated to meet the future timber demand especially from short rotational exotic species of *Tectona grandis* (Teak) and *Swietenia macrophylla* (mahogany). There was in fact not much effort dedicated to gather the seeds nor seedlings of these exotic tree species that eventually resulted in the shortfall. Thus, the opportunity to establish productive plantation was not achieved particularly for the timber commodities except for a couple of fruit trees to support food security as well as potential high value essential oil commodity for economic opportunities into the future.

Most of the planting done were for protective plantation purpose that will basically support the provision of important environmental services e.g. for soil protection, protection of water sources, rehabilitation of degraded lands, soil fertility improvement, combating desertification, reducing open spaces for invasive species incursion and increasing removal of carbon dioxide from the atmosphere or carbon sequestration[20].

[19] Program Management for Development Professional Guide, www.pm4ngos.org
[20] Jurgen Bauhus, Peter van der Meer and Markku Kanninen (2010); Ecosystem goods and services from plantation forests, Centre for International Forestry Research.

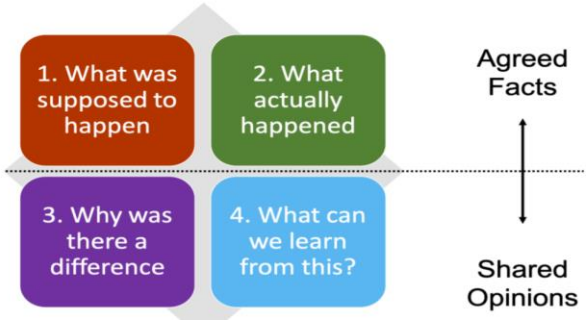


Figure 12: After Action Review Model

Figure 13: Terminal Review Workshop in Lavena

Table 6: After Action Review Results

What was the Target?

Activity	Target
Degraded forests restoration	6 ha
Community woodlots	5 ha
Riparian restoration	3 ha
Coastal restoration	3 ha
Agroforestry models	3 models

What was achieved?

Activity	Target	Output
Degraded forests restoration	6 ha	5 ha
Community woodlots	5 ha	0 ha
Riparian restoration	3 ha	3 ha
Coastal restoration	3 ha	3 ha
Agroforestry models	3 models	3 models

Why was there a difference?

Establishment of community woodlots was not achieved due to low effort in obtaining seeds or seedlings for Teak and Mahogany. There was more effort in the production of native rather than exotic species and no communication for the supply of woodlot species in the end.

What can we learn?

A well thought out deliberation and collective decision is important and required when project introduce exotic tree species in a degraded system, due to the risk of invasiveness for example the mahogany species. Better coordination is necessary particularly with the seedling supplier end of the tree species and the quantity that will be needed for the restoration work.

5.0 LESSONS LEARNED

5.1 Decentralize the nursery within the watersheds

If there was something that could have been done differently, it will have to be the option to raise the seedlings at the three districts level rather than having a centralized nursery. It could have been more efficient, reducing the considerable delays in seedling productions, encouraging actively support early engagement at the community level, transferring basic seedling production and management knowledges and reduce the rationalising of tree seedling between the three implementing agencies. One obvious challenge that will have to be mitigated is the disagreement within the community of the best location for the district nursery and this can cause tension and subsequently affect commitment and engagement on project implementation later. Lessons from community-based nurseries in the past has not been encouraging, however this can be mitigated with some form of tangible benefits or incentives provided, for example, the option to purchase all viable seedlings for future restoration work or even better direct monthly honorarium.

An important aspect to consider for any tree planting project is seedling production plan. Ample lead time must be given to produce seedlings which will basically require a minimum of six months before any out-planting plan can roll out.

5.2 Inclusive ownership and participation

Inclusive ownership and participation were particularly slow on the ground and may have been due to poor coordination and communication between the CI and local communities. Irregular visitation by CI may have contributed in some ways as well as lack of communication and coordination among the local representatives. Chiefly or "bose vanua" leadership may have been overlooked also during implementation, thus the lack of ownership. The Nacogai-Lavena community was seen to be domineering in the work while the people from the other two watersheds of Naselesele and Naqeru shy away from active participate. Both the Wainikeli watershed coordinator and the district representatives are from the Nacogai-Lavena watershed which may have been viewed as dominating and influencing the flow of the work and can be assumed to getting all the best and benefitting the most, may be in terms of incentives and support. Again if there is something to be done differently when dealing with the community in the future, implementing partners must be seen to be neutral and not closely associated with one particular village or community, as in this case, where CI team always camp in Lavena which may have negatively affected the moral and interests of other villagers.

Another issues that needs to be addressed adequately is the poor communication and networking skills especially the flow of information from the project level to the coordinators and to village based working groups, village councils and to the ordinary villagers. There may have been possibly differences in perceptions, viewpoints and assumptions between the different stakeholders that dampen the interests and incentive to actively participate in the project. People in the local communities will need a lot of follow up discussion and one to one discussion to be able to keep on the loop and be engaged and this is why the working group suggested that support be channelled to support the village visitation of the watershed coordinator and the district representatives to drum up support and readiness.

There was also a lot of individualism seen particularly with the village headman making the sole decision without consulting the local people. Some of the planted trees were uprooted and destroyed by the local people, which indicated their disagreement on the use of the site. It is, therefore, crucial to conceive watershed management programmes with a community involvement focus, whenever human activities are likely to be conflicting with conservation and restoration requirements[21].

[21] Botero, L; Incentives for Community Involvement in Upland Conservation, http://www.fao.org/3/ad085e/AD085e19.htm

5.3 Community Empowerment

Community empowerment is an important tool that can encourage stronger engagement of the local people in the community development work. It will also ensure ownership and sustainability into the future. One of the initial decisions during the inception phase was to select the village champions to be part of the working group that will oversee the implementation of the EbA interventions at the local level. Even with the formation of the group, there was weak leadership, poor communication, and lack of coordination among the working group with the watershed coordinator and the IA.

One thing that could be done differently is to empower the working group to lead all the groundwork with minimal support from the IA. Formal arrangement should have been made including the development of a simple Terms of Reference to guide the working committee on the roles that they will play. Activities such as organising the transporting of seedlings to the planting sites, mobilizing of community to do the planting, weeding maintenance and survival counting and the normal monitoring and plantation management work but with ample financing support to cover the ground work with quarterly visitation by the IA.

Equally important to consider community incentive components such as alternative livelihood options or small-scale community development project support that helps to elevate community engagement in restoration work. Small farmers living at the subsistence economy level do not have the capital required to implement restoration and conservation measures and cannot afford to devote time to activities which will bring no immediate revenue. Monetary or non-monetary incentives is therefore crucial to entice community engagement in the restoration and conservation activities.

5.4 Gender Inclusivity

The engagement of women and youths was not strongly pursued during the implementation phase and is an area that will need a lot of strengthening particularly since women in I'Taukei cultural setting are usually the backbone of the family, in sustaining livelihoods. Similarly, youths are usually the un-utilized asset to any local community[22] that needs to be recognised, tapped upon, and used. As common in most developing states, the low level of participation of the women and youths was largely due to the culture and religion which does not give them room for active participation, especially on decision-making. However, women and youths are very much capable of communicating with the men at home on what they may want, or think is important to do when it comes to community project implementation, especially in the often-patriarchal cultural system.

5.5 Building on the local practices

Forest restoration may be applied differently from site to site and so this work in Taveuni is completely different from the Nakauvadra sites in Ra where CI had been working for the last ten years, because of the different range of challenges and issues to be addressed. This demands innovative thinking, critically analyse and good observation of the traditional as well as the contemporary land restoration practices that are currently in use by the local farmers.

A typical lesson seen is the thriving agroforestry practices in Taveuni, where coconut based intercropping system was common and because of the declining fertility, the use of nitrogen fixing species particularly Drala - *Erythrina variegate*, is quite obvious in the mix crop farming practices. A well thought out process from the start is important to understand the existing agroforestry practices with a clear view of the local farmers perceptions before any new tree- fruit tree species combination can be introduced that complement the existing practices.

[22] Emily Erasito, 2016; In Fiji, youth are key to Cyclone Winston recovery, https://www.pacific.undp.org/

The inability to capture the Teitei Taveuni stories and approaches to guide the field implementation work, is an important lesson in terms of using the localised practices that has been proven over the years to be successful. Even with a few members of the working committee who are associated members of Teitei Taveuni, reflections on innovative practices done through the Teitei Taveuni initiative were not shared or discussed thorough, which was a missed opportunity.

6.0 CONCLUSION

PEBACC project in Taveuni for this phase covers restoration work through tree planting activities on degraded forest landscape for the enhancement of important ecosystem services. The restoration intervention targeted the degraded forest area, particularly the highland water catchment forest areas, as well as the abandoned agriculture land that are often clear-felled for farming, establish agroforestry models as well as riparian and coastal restoration. These EbA interventions basically aim to restore, in the long-term key ecosystem services especially by sustaining reliable water sources, stabilizing soil to reduce sedimentation from accelerated erosion, invigorate soil fertility through agroforestry practices and create alternative sources of livelihoods, increases carbon sequestration. Above all, such restoration initiatives will strengthen community resilience to the impact of climate change.

The total areas planted in Wainikeli was around 14 hectares which is comparatively insignificant when considering the over 9,000 hectares of degraded landscape within the district. However, the long-term impact can be quite significant if the plantings are properly maintained and protected from invasive vines and weeds as well as from roaming herds. The only shortfall from the set target was the inability to establish community woodlot as was planned which was attributed to the lack of effort to source fast growing timber tree species seeds particular of mahogany and teak due to poor coordination with the nursery team to raise the required timber species. Part of the reason are the strong reluctancy in bringing exotic tree species due to the risk of invasiveness, particularly for the mahogany species. Impact indicator of the EbA activities in Taveuni will be relatively significant into future both ecologically, economically, and socially. Ecologically the restoration interventions will significantly enhance the provision of important environmental services particularly on the restoration of the locally managed water system as well as climate mitigation in the long term.

Implementation of EbA intervention at the local setting require good coordination and communication to gain strong community support and engagement, since the local communities are the primary beneficiaries to the impact of the restoration work undertaken. At the same time, they were also part of the contributing agents to ecosystem degradation in the first place, it is important to gain their understanding and support so that they became the agent of change. The theory of change primarily targeted the local people to identify the immerging issues that affects the provision of tangible environmental services such as water and be able to identify the causal links to the key drivers. Eventually this will enlighten their understanding of the best intervention options or strategy to abate or address environmental degradation. Community learning by implementing the strategic intervention options can eventually spur the interests to amplify the lessons learned through their day to day land use decision making processes and practices.

Finally, long term monitoring and maintenance in the first three to five years will be crucial if results and impacts are to be effectively seen. It signifies the need to strengthen the local support group or the Yaubula management support team at the village, district, and provincial level by fostering partnership with national government agencies. Mainstreaming of the lessons learned, scaling up and expansion of the established model in the community are not usually happening and this is an important are to improve upon particularly in transition from project model to practically implementation level.

7.0 ANNEXES

Annex I – Planting Site Information

PLANTING SITES INFORMATION

SITE:	**LAVENA WATER CACHTMENT**
POLLING DATE:	9/10/2019
PLANTING DATE:	9/10/2019
AREA PLANTED:	1.29 HA (358 SEEDLINGS)
SPECIES PLANTED:	Vesi-*Intisia bijuga*, Kaudamu- Myristica spp, Moivi- *Kingiodendron platycarpum*, Soursop-*Annona muricata*, Avacado- *Persea americana*
BASE LINE STATUS:	This is the water source for Lavena village. The water source was covered with creepers and only three *Inocarpus fagiferus* trees along the creek. The edges were predominantly covered with *Cyathea lunulata* (balabala) which indicates a typical abandoned farming land exercised in the area.
PLANTING SPACING:	6m x 6m
PLANTATION MAITENANCE:	Restoration plot is maintained monthly during village week.
SURVIVAL RATE:	70%
DATE ASSESSED:	29/01/2020
BEAT UP:	29 SEEDLINGS DIED AND REPLACED
GEO-REFERENCE:	Not Captured

SITE:	**LAVENA COASTAL**
PLANTING DATE:	2018
AREA PLANTED:	0.3 ha (358 Seedlings)
SPECIES PLANTED:	Tavola – *Terminalia catappa*,
BASE LINE STATUS:	The site as common in coastal condition is mainly covered with coastal creepers *Ipomea cairica* (wa vuti) and *Cocos nucifera* (niu) and *Calophyllum inophyllum* (dilo) and directly exposed to the drastic winds with sea and sand sprays.

PLANTING SPACING: 3m x 3m

PLANTATION MAITENANCE: Plantings was gone exclusively by the community from the seedlings they raised and had been maintained through their normal village weeding and cleaning roster.

SURVIVAL RATE: 60%

DATE ASSESSED: 29/01/2020

GEO-REFERENCE:

Points	Latitude	Longitude
1	16°52’22.04”	179°52’43.20”
2	16°52’25.40”	179°52’41.90”
3	16°52’25.40”	179°52’42.50”
4	16°52’21.40”	179°43’43.80”

SITE: **KOROVOU – TAVORO WATERFALL - RIPARIAN**

POLLING DATE: 10/10/2019

PLANTING DATE: 10/10/2019

AREA PLANTED: 1.82 hectares (508 SEEDLINGS)

SPECIES PLANTED: Vesi-*Intisia bijuga*, Dakua makadre-*Agathis macrophylla*

BASE LINE STATUS: The area planted is adjacent with the Tavoro waterfall along the walkway, covered with creepers which was before covered with Dawa and Ivi trees and was cut down for timbers for house construction and farming.

PLANTING SPACING: 6m x 6m

PLANTATION MAITENANCE: Restoration plot is maitained montly by villages during village week.

SURVIVAL RATE: 70%

DATE ASSESED: 29/01/2020

BEAT UP: 30 SEEDLING DIED AND REPLACED

GEO-REFERENCE :

Points	Latitude	Longitude
1	16°49’35.50”	179°52’41.10”
2	16°49’36.50”	179°52’41.60”
3	16°49’37.40”	179°52’39.20”
4	16°49’37.00”	179°52’39.10”

SITE: **VIDAWA**

POLLING DATE: 12/10/2019

AREA PLANTED: 1.05 hectares

SPECIES PLANTED: Vesi-*Intisia bijuga*,Yasi-*Santalum yasi*, Kaudamu-*Myristica spp*

BASE LINE STATUS: The site is the side hill near the road and immediately located opposite Vidawa village. This site were exclusively covered with weeds and remanant cuttings of cassava so it has been an abandoned agriculture site. Also constructed on the site is the water tank or resservior of the village water system. Already planted on the sites are some mahogany trees and an old growth Agathis macrophylla (dakua) tree that could have been planted around 1980's during the work on the Bouma Eco-torism site.

PLANTING SPACING: 6m x 6m

PLANTATION MAINTENACE: Vidawa village carrie out their maintenance work during village week.

SURVIVAL RATE: 70%

DATE ASSESSED: 29/01/2020

BEAT UP: 80 SEEDLINGS DIED AND REPLACED

GEO-REFERENCE:

Points	Latitude	Longitude
1	16°49'8.58"	179°52'5.70"
2	16°49'10.07"	179°52'6.78"
3	16°49'6.10"	179°52'7.10"
4	16°49'6.80"	179°52'5.50"
5	16°49'9.12"	179°52'5.46"

SITE: **VIDAWA QALI Settlement – Eco-Tourism Trail**

POLLING DATE: 02/10/2019

AREA PLANTED: 1.34 hectares

SPECIES PLANTED: Vesi-*Intisia bijuga*,Yasi-*Santalum yasi*, Dakua- *Agathis macrophylla*, Kaunicina-*Canarium harveyi*, Sosape- *Annona muricata*

BASE LINE STATUS: The site is an eco – tourism walk way that is normally used for bird watching purpose and the villagers had planted fruit trees and native trees about two years back to attact birds into the area. We have inspected that the trees are about 3meters in height. The restoration activity was continuited the plantating activity which was done by villages. Area restored was just grassland with creepers.

PLANTING SPACING: 6m x 6m

PLANTATION MAINTENACE: Vidawa village carried out their maintenance work during village maintenance week.

SURVIVAL RATE: 85 %

DATE ASSESSED: 29/01/2020

BEAT UP: 54 were seen dead and were replanted

GEO-REFERENCE:

Points	Latitude	Longitude
1	16°51’33.90”	179°52’59.01”
2	16°51’34.30”	179°52’57.40”
3	16°51’33.80”	179°52’57.60”
4	16°51’33.00”	179°52’57.06”
5	16°51’33.23”	179°52’58.32”

SITE: **VIDAWA Villa Maria Settlement - Agroforestry**

PLANTING DATE: 12/10/2019

AREA PLANTED: 50 trees

SPECIES PLANTED: Vesi-*Intisia bijuga*,Yasi-*Santalum yasi*, Sosape- *Annona muricata,* Avocado-*Persea americana,*

BASE LINE STATUS: This is one of the agroforestry model that was developed with the interested farmer. He has alreary an integrated agroforestry cropping systems that includes perinial species like *Hibiscus manihot* (bele) annual crops including *Colocasia esculenta* (taro), *Musa balbisiana* (vudi), *Musa* spp (jaina) and long term crop like *Piper methisticum* (yaqona) as well as tree particularly drala and coconut that is common in Taveuni.

PLANTING SPACING: No specific spacing

PLANTATION MAINTENACE: No specific maintenance date set

SURVIVAL RATE: 98%

DATE ASSESSED: 29/01/2020

BEAT UP: 1 seedling was replaces

GEO REFERENCE:

Points	Latitude	Longitude
1	16°48’58.10”	179°52’8.60”
2	16°48’58.10”	179°52’9.50”
3	16°48’59.50”	179°52’8.07”
4	16°48’58.90”	179°52’7.90”

SITE:	**WAITABU WATER SOURCE**
POLLING DATE:	01/02/2020
AREA PLANTED:	1.0 hectare
SPECIES PLANTED:	Vesi-*Intisia bijuga*, Damanu- *Calophyllum vitiensis*
BASE LINE STATUS:	Area is covered with shrubs and creepers. This is the village water source to be replanted with native trees to be protected as requested by the village headman.
PLANTING SPACING:	6m x 6m
SURVIVAL RATE:	Just planted.
DATE ASSESSED:	02/02/2020
BEAT UP:	None.
GEO-REFERENCE:	Not Captured

SITE:	**WAI RIPARIAN RESTORATION**
POLLING DATE:	12/10/2019
AREA PLANTED:	0.36 ha
SPECIES PLANTED:	Vesi-*Intisia bijuga*, Sosape-*Annona muricata*, Ivi-*Inocarpus fagiferus*,Vetiver grass-*Chrysopogon zizanioides*
BASE LINE STATUS:	Wai creek is located beside Wai village covered with scatted bamboo patches and para grass. This covers both edges of the creek. The village normally experience flooding during heavy rain.
PLANTING SPACING:	Vetiver – 3m x 3m, Trees- 0.5m x 1m
SURVIVAL RATE:	100% SURVIVAL
DATE ASSESSED:	02/02/2020
BEAT UP:	NONE.
GEO-REFERENCE:	Not Captured

SITE: **QELENI WATER SOURCE**

POLLING DATE: 11/10/2019

AREA PLANTED: 1.98 Ha

SPECIES PLANTED: Vesi-*Intisia bijuga*

BASE LINE STATUS: The Qeleni palanted site is located about 100metrs from the village. The villagers are use of this water source due to their main water source is being affected by poor farming plan which makes it dry during dry weather. The area is just covered with creepers and raintrees growing along the creeck beside the village. The creeck edges beside the village are farmed with Dalo and Yaqona plantation.

PLANTING SPACING: 6m x 6m

PLANTATION MAINTENANCE: The restoration plot is maitained by the village durin their village week every first week of every month.

SURVIVAL RATE: 100%

DATE ASSESSED: 30/01/2020

GEO-REFERENCE: Not Captured

SITE: **NASESELE UPPER CATCHMENT**

POLLING DATE: 12/10/2019

AREA PLANTED: 1.0 Hectare

SPECIES PLANTED: Vesi-*Intisia bijuga*, Ivi-*Inocarpus fagiferus*

BASE LINE STATUS: The restoration site is the upper catchment of the Naselesele communities. It was a forested area before and now it has been one of the main areas given by the landowners to be leased on agriculture for farming. Due to poor farming practices, trees are cleared or cut down for farming. This one of the hot spots which need to be replanted on the Naselesele catchment. The restored area is grassland and shrubs.

PLANTING SPACING: 6m x 6m

PLANTATION MAINTENANCE: Restoration site is just maintained once by villagers and CI

SURVIVAL RATE: 60%

DATE ASSESSED: 30/01/2020

BEAT UP: 80 Seedings dead and replaced

NOTE: 210 Seedlings still with the Mataqali member for planting later.

GEO-REFERENCE: Not Captured

Annex II Wainikeli Restoration Newspaper Article

24 feature

CONSERVATION INTERNATIONAL

More Trees Planted in Wainikeli

THIS IS PART OF REFORESTATION WORKS TO HELP EXPLORE AND PROMOTE ECOSYSTEM BASED ADAPTATION (EBA) OPTIONS FOR ADAPTING TO CLIMATE CHANGE

MINISTRY OF WATERWAYS & ENVIRONMENT

VACANCIES

By SERA NAGUSUCA

.fijitimes.com.fj 3304111 3301521

Farmers opt for nature-based solution

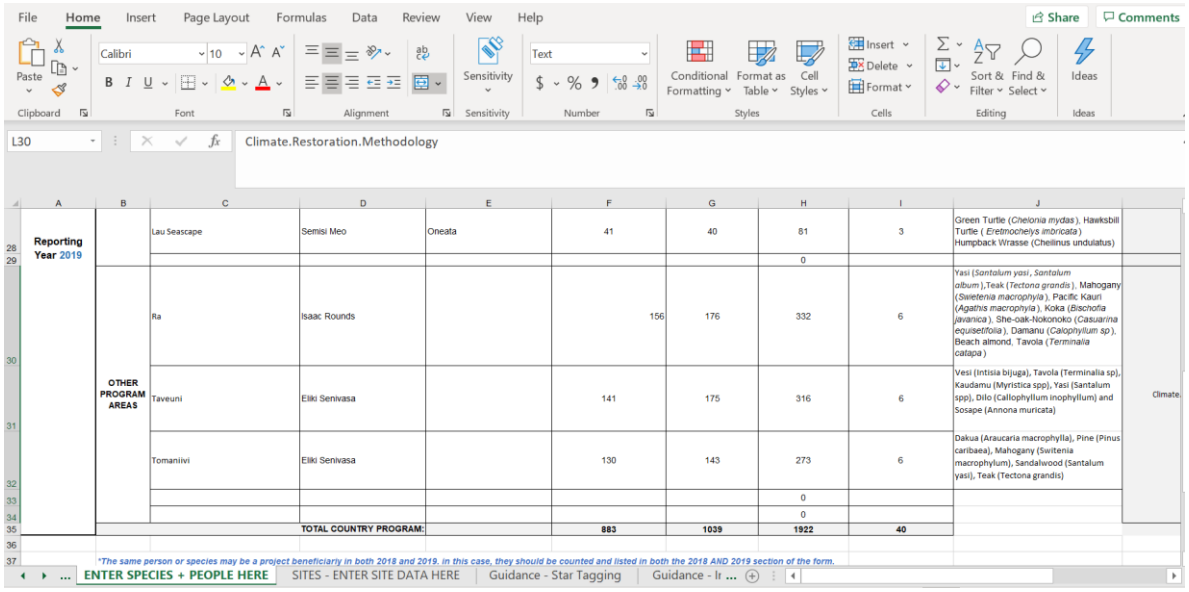
Nawaqaliva's bathroom made out of shrub and trees. Picture: SUPPLIED

A yaqona farmer dries his yaqona cuttings. Picture: SUPPLIED

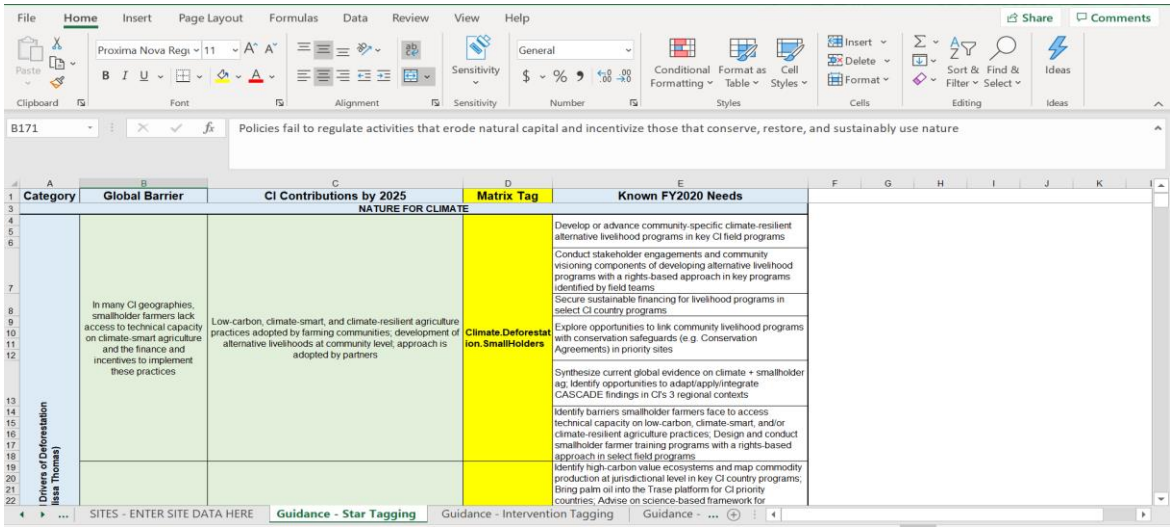
Nawaqaliva's farm. Picture: SUPPLIED

One of the water sources. Picture: SUPPLIED

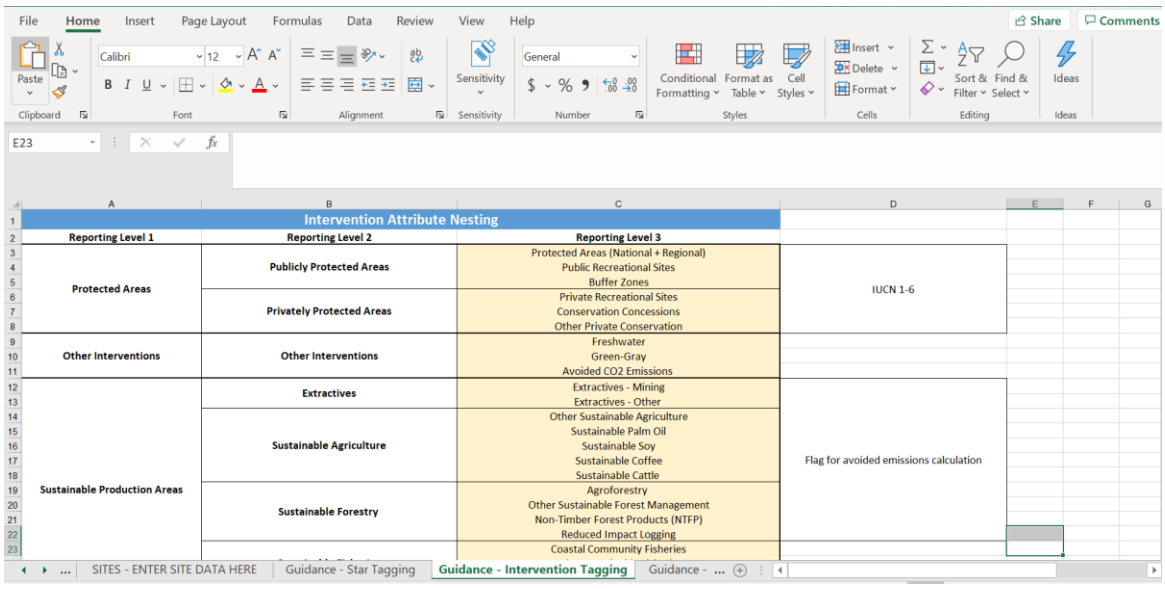
Annex III IMPACT INDICATOR MODEL



28	Reporting Year 2019		Lau Seascape	Semisi Meo	Oneata	41	40	81	3	Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*) Humpback Wrasse (Cheilinus undulatus)	
29								0			
30		OTHER PROGRAM AREAS	Ra	Isaac Rounds		156	176	332	6	Yasi (*Santalum yasi*, *Santalum album*),Teak (*Tectona grandis*), Mahogany (*Swietenia macrophyla*), Pacific Kauri (*Agathis macrophyla*), Koka (*Bischofia javanica*), She-oak-Nokonoko (*Casuarina equisetifolia*), Damanu (*Calophyllum sp*), Beach almond, Tavola (*Terminalia catapa*)	
31			Taveuni	Eliki Senivasa		141	175	316	6	Vesi (Intisia bijuga), Tavola (Terminalia sp), Kaudamu (Myristica spp), Yasi (Santalum spp), Dilo (Callophyllum inophyllum) and Sosape (Annona muricata)	Climate
32			Tomaniivi	Eliki Senivasa		130	143	273	6	Dakua (Araucaria macrophylla), Pine (Pinus caribaea), Mahogany (Switenia macrophylum), Sandalwood (Santalum yasi), Teak (Tectona grandis)	
33								0			
34								0			
35			TOTAL COUNTRY PROGRAM:			883	1039	1922	40		
36											
37	*The same person or species may be a project beneficiariy in both 2018 and 2019. in this case, they should be counted and listed in both the 2018 AND 2019 section of the form.										



	Category	Global Barrier	CI Contributions by 2025	Matrix Tag	Known FY2020 Needs
3			NATURE FOR CLIMATE		
4-6	(Drivers of Deforestation - Iissa Thomas)	In many CI geographies, smallholder farmers lack access to technical capacity on climate-smart agriculture and the finance and incentives to implement these practices	Low-carbon, climate-smart, and climate-resilient agriculture practices adopted by farming communities; development of alternative livelihoods at community level; approach is adopted by partners	Climate.Deforestation.SmallHolders	Develop or advance community-specific climate-resilient alternative livelihood programs in key CI field programs
7					Conduct stakeholder engagements and community visioning components of developing alternative livelihood programs with a rights-based approach in key programs identified by field teams
8					Secure sustainable financing for livelihood programs in select CI country programs
9-12					Explore opportunities to link community livelihood programs with conservation safeguards (e.g. Conservation Agreements) in priority sites
13-18					Synthesize current global evidence on climate + smallholder ag; Identify opportunities to adapt/apply/integrate CASCADE findings in CI's 3 regional contexts Identify barriers smallholder farmers face to access technical capacity on low-carbon, climate-smart, and/or climate-resilient agriculture practices; Design and conduct smallholder farmer training programs with a rights-based approach in select field programs
19-22					Identify high-carbon value ecosystems and map commodity production at jurisdictional level in key CI country programs; Bring palm oil into the Trase platform for CI priority countries; Advise on science-based framework for



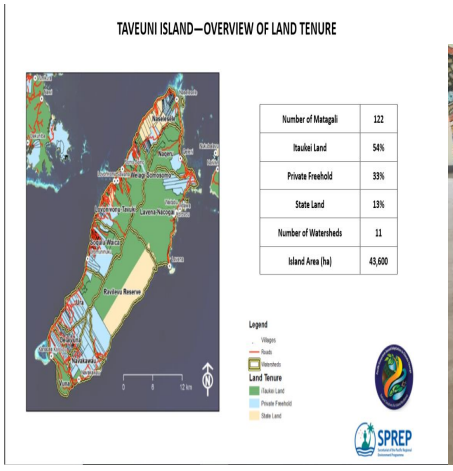
	Intervention Attribute Nesting			
2	Reporting Level 1	Reporting Level 2	Reporting Level 3	
3-8	Protected Areas	Publicly Protected Areas	Protected Areas (National + Regional) Public Recreational Sites Buffer Zones	IUCN 1-6
		Privately Protected Areas	Private Recreational Sites Conservation Concessions Other Private Conservation	
9-11	Other Interventions	Other Interventions	Freshwater Green-Gray Avoided CO2 Emissions	
12-23	Sustainable Production Areas	Extractives	Extractives - Mining Extractives - Other	Flag for avoided emissions calculation
		Sustainable Agriculture	Other Sustainable Agriculture Sustainable Palm Oil Sustainable Soy Sustainable Coffee Sustainable Cattle	
		Sustainable Forestry	Agroforestry Other Sustainable Forest Management Non-Timber Forest Products (NTFP) Reduced Impact Logging	
			Coastal Community Fisheries	

Annex IV Final (Terminal) Field Report

SPREP PEBACC -WAINIKELI DISTRICT

FINAL FIELD VISIT REPORT

30th February 2020



CONSERVATION INTERNATIONAL

1.0 Background

The increasing sensitivity of the island system in the Pacific to environmental, social and economic change has prompted the need to seek and implement strategies that strengthen communities through interventions that buffer the supply and diversity of ecosystem services. The Secretariat of the Pacific Regional Environment Programme (SPREP) with funding from the German Federal Ministry of Environment (BMUB) International Climate Change Initiative (IKI), has initiated a four-phase project to seek and implement a strategy to strengthen communities through ecosystem-based adaptation (EbA) and management activities. The Pacific Ecosystem-based Adaptation to Climate Change project (PEBACC) is focused to identify, prioritize and implement EbA strategies to meet critical needs in three countries (Fiji, Vanuatu and Solomon Islands) at three different major scales: a national, provincial and a focused island scale.

Key objective of the PEBACC project is to identify what climate change factors and what suite of other circumstantial factors are limiting socio-economic resilience, particularly as it pertains to ecosystem services and the resilience of these services through time, and to prescribe a range of EbA actions that can broaden the range of possibilities for communities through the enhancement of ecosystem services.

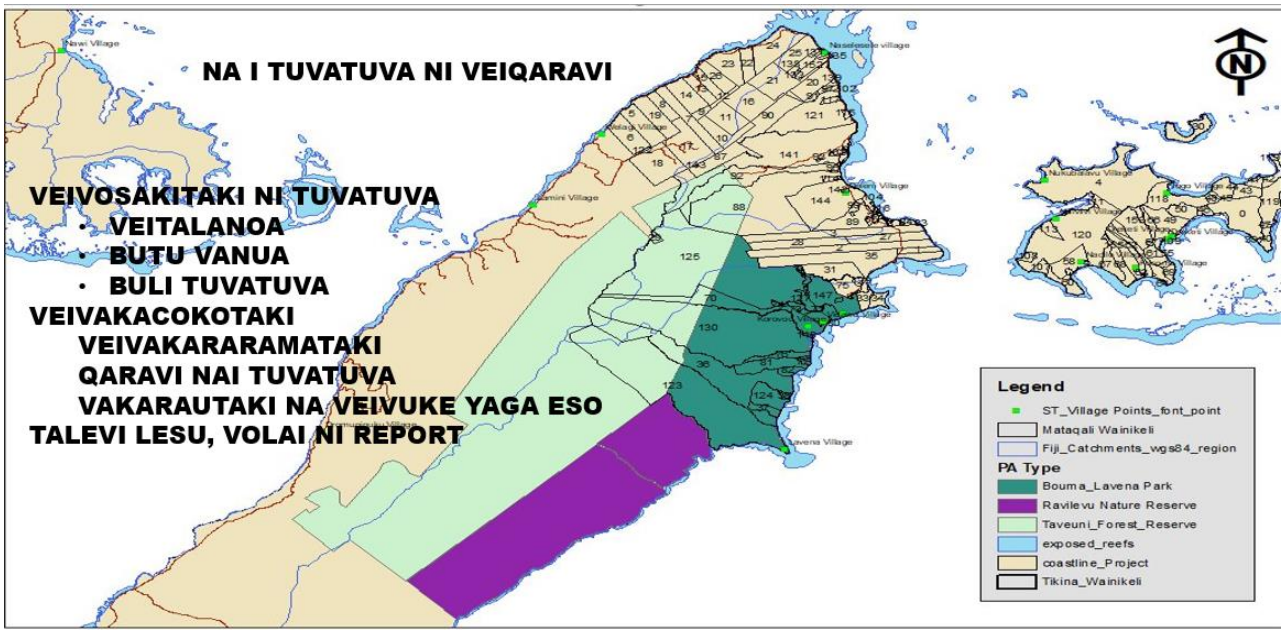
2.0 INTRODUCTION

The Pacific Ecosystem Based Adaptation for Climate Change is a regional project that is undertaken by the South Pacific Regional Environmental Program in Fiji and few other countries in the Pacific. One of the sites in Fiji is focusing on Taveuni, whereby Conservation International have been contracted to lead the landscape restoration work within the district of Wainikeli, since 2018 and to be completed by April 2020. The target is to restore the degraded abandoned agricultural land, degraded forests land, degraded riparian zones and degraded coastal margins through tree planting as well as through agroforestry practices and in particular to work with the local community, empowering the local champions or the Yaubula Management Support Team (YMST).

CI trained the community on community nursery development and seedling production, silviculture practices on poling, line cutting and tree propagation, field restoration through tree planting work. The overall plan as depicted in the local dialect (in the box below) includes community planning workshop, land reconnaissance to determine the best place to restore based on the severity of the degradation, capacity building and field restoration work, coordination with other relevant government program support, and finally to review and learn from all the activities that were implemented and compilation of the final report.

Since the project is now reaching its terminal phase, it is highly appropriate to undertake this final round of field visitation in order to assess the survival rate of the trees planted by the community as well as to be able to map out the areas that has been restored for the development of some impact indicator analysis under the CI impact assessment scenario. It is only appropriate to officially inform the people of the closing down of the work through the normal community consultation and awareness forum and to showcase what has been achieved to date through their effort and support as against the set target as was prepared during the initial community planning workshop. It was also seen as important to be able to reflect to the community some of the key lessons learned and how it should have been done better as well as to capture some of the communities view of how the project fair as well as what should have been done differently, if similar projects comes their way in the future.

Figure 1: Proposed implementation plan by the Community



3.0 Objectives

The main objective of the final field visitation was to:

- Re-visit in order to assess the status of the restoration work that was done in the district, particularly in terms of the survival rate as well as the maintenance schedule as organised by the community
- It offers also the opportunity to touch based with the members of the community of their management plan for the maintenance as well as expansion of the plantation in the future
- It is also a good time to share with the community some of the lessons learned from both sides that can support future initiatives.
- For CI in particular, the visit also provide the opportunity to be able to capture some important data that will support the shape files for Wainikeli as well as for the development of the impact indicator model from all the work done under the PEBACC project.

4.0 Team Composition

The team comprises of David Hunt from the CI HQ who was avail to assist in the field data capturing for the development of field impact indicator model for the Wainikeli site and accompanied by Kalesi Nadalo the local support who is tasked to populate all the necessary information that will support the development of the impact indicator model. I was there to oversee the task completed and to follow up on the terminal discussion with the local support group on the achievements to date and the remaining level of work that CI will participate on in the future.

The advance field team that called in earlier to Taveuni however, have been physically involved in the mobilization of support in the community for the maintenance of the planted stocks on the ground as well as the survival counting, seedling delivery and beating up work with the locals.

5.0 People that were met

Name	Village	Designation
Ilaisa Roqovou	Bainiose	
Liqorio Tukuro	Vunitarawau	
Rajesh Prasad	Dala	Indo-Fijian/Wakatu rep
Kusitino Livi	Qeleni	
Mere Nawi Vueti	Qeleni	
Tomasi Laladidi	Wai	
Paulo Manaua	Qeleni	
Petero Waisea	Lavena	
Seresitiono Maravu	Waitabu	
Mikaele Cika	Waitabu	
Iakobo Matana	Waitabu	
Elia Digogo	Vidawa	
Rafaele Nakau	Naba	
Sipiriano Qeteqete	Lavena	Wainikeli Watershed Coordinator
Apolosi Korovou	Qeleni	
Paulo Lasei	Vidawa	
Berenado	Lavena	District Rep
Paul Waqaliti	Waitabu	Wakatu Rep/YMST rep
Kelera Macedru	SPREP	Taveuni Focal Point

6.0 Achievements

One of the major achievements is the capturing of geographic information system data sets on the field planting boundaries for all the restoration plantings established in the district. This data set will be used later for the development of the Impact Indicator model for Conservation International work in Wainikeli Taveuni along with other important information that will have to be populated manually into the indicator assessment forms.

The other major achievement during the trip was the closing phase of the Wainikeli PEBACC work with CI through the participatory review and implementation result feedback through the YMST workshop. The workshop accumulated over 25 local participants that includes the YMST members as well some of the village elders. Some of the key achievements from the workshop are tabulated below.

- **Restoration at Wainikeli District**

In summary, the field restoration effort over the degraded forests could not be achieved basically due to the seedling production delays as well as the rationalized seedlings stocks that were to be distributed fairly to all the three districts in Taveuni, thus may have contributed to the shortfall. In terms of woodlots, the biggest challenge was in unavailable plantation species seedlings for the purpose, especially for the teak species. Riparian restoration was achieved successfully but could have been done better if the site was selected properly. Agroforestry models was quite successful because local farmers are practicing planting of food and cash crops under coconut and mix planting with banana, pawpaw, taro and kava. One of the commonly used nitrogen fixing plants is Drala, *Erythrina variegate*, which are easy to cultivate through cuttings.

Table 1: Summary of the Restoration Result

Activities	Target	Achieved	Remarks
Restoration of degraded forests	6 ha	5 ha	Rationalized seedlings
Establish woodlots	6 ha	0 ha	Woodlot seedlings not available
Riparian restoration	3 ha	3 ha	Wai, Waitabu, Qeleni
Agroforestry models	3 models	3 models est.	Naselesele, Vila Maria, Lavena
Coastal restorations	2 models	3 models est.	Nakorovou, Lavena, Navakacoa

- **Impact Indicator Model for CI work in Wainikeli**

Data capturing for impact indicator analysis comprises of the geographical informational reading of the plantation boundaries while other data that includes population data and land use data will be added later into the formulated indicator framework to be able to complete the result for the Wainikeli district PEBACC work by CI. The preliminary results are yet to be completed and this will be provided at a later stage by David Hunt from DC office.

7.0 Lessons Learned

Some of the key lessons learned from the implementation of the SPREP-PEBACC project in Taveuni includes:

- **Nursery production and species choices**

Nursery production is a key component of the restoration work that must be planned well in advance. This was an area that was not really done well, which delay the implementation work on the ground. Equally important is the clarification of the species that must be raised and why it is raised, which was again one area that needs a lot of prior thinking, open discussion and planning before it is implemented. In Taveuni, the specie to use for agroforestry was not planned well especially the lack of nitrogen fixing plants which are important to restore the fertility of the soil.

- **Strengthen local ownership**

Mobilizing of the local support to drive the work on the ground was not strong enough even though there was a designated watershed coordinator who was tasked to link the project activities with the local community. There was a lot of mis communication and lack of coordination in the community and very low participation seen on the ground.

- Key lesson as captured from the local community is tabulated below.

Table 2: Some of the weakness as perceived by the communities and possible solutions

Weakness in project implementation	Possible solution
Information flow from the project to the district meeting and village meeting was not good. (Malumalumu na veitaratara mai vei ira na lewe ni vuvale, koro ki na bose vanua, bose ni tikina)	Strengthen communication and information flow from the district to the village and to the people (Me matata na I tukutuku mai na bose ni Tikina ki na bose vanua ki vei ira na lewe ni vanua)

Villages were not clear of what they really need (Sega ni kilai vinaka na ka me ganita na veikoro)	Need to do a lot of awareness work (Gadrevi vakalevu na veivakararamataki)
Lack of interest because of the low perception of the benefits (Sega na kauwai baleta ni ra nanuma ni sega ni yaga)	People will be interested if they are aware (Ni levu na veivakararamataki ena qai kawai kina vakalevu na tamata)
Lack of knowledge on the benefit of trees (Lailai na kilaka baleta na bibi ni veikau)	More awareness/capacity building (Me levu na vuli baleta na yaga ni kau)
Lack of seedling stock (Lailai nai tei ni kau)	Develop more community-based nurseries (Me levu na vanua ni bucibucini ena veikoro se tikotiko vagalala)
	To consider the inclusion of alternative source of livelihood (Vakalevutaki nai vurevure ni lavo me vaka na cakacaka ni liga kei na saravanua)

8.0 Conclusion

The whole target for this restoration work in the Wainikeli district under the SPREP-PEBACC project was highly ambitious, especially on the woodlot plantation target which could not be achieved due to inability to collect/purchase commercial tree species such as Teak and Mahogany. The program was relatively short term with small funding stream that call for smarter approach especially in engaging with the key players in the community as well as the selections of tree species that are important for the restoration objectives. It would have been appropriate to establish community nursery instead of the centrally located nursery in Mua where efficient coordination of support with relevant government agencies has been highly demanding and often the key obstacles all along.

Figure 2: The SPREP PEBACC project nursery, established in Mua Agriculture Station, Taveuni