An Educational Initiative to promote and encourage utilization of The Vetiver System (VS) as a readily available soft engineering green technology to mitigate land erosion in Grenada

Monitoring and Evaluation Report

Implemented by: Eco Strategies Grenada Inc. With Support From: GEF SGP Grenada

M & E Report Prepared by: Dr. Vanessa Slinger-Friedman, Professor of Geography
Kennesaw State University
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Background and Overview

In its proposal ESGI identified the problem their project was designed to address - the many areas of degraded soils, unprotected infrastructure and vulnerable coastlines in Grenada that are at risk for erosion, flooding, loss of top-soil, and destabilization (Fig. 1). The causes of this problem include an historical misuse of agricultural lands that are annually stripped bare of vegetation to plant crops, little or no return of organic matter to the soils, injudicious bulldozing of house sites and roadways resulting in poor drainage and removal of protective vegetation from the coastline. ESGI highlighted the main challenge to overcoming this problem as a lack of knowledge about potential strategies to reverse the degradation and the means to disseminate this knowledge to affected communities and other stakeholders.

Figure 1 On the way to Gouyave, land degradation and soil erosion produce heavily silted rivers after a rain (Photo taken by Vanessa Slinger-Friedman).

Based on the submitted and approved proposal to the UNDP SGP, the goal of this project was to disseminate information about the Vetiver System (VS) to a wide cross section of communities and entities and empower them with the knowledge of an easily available soft engineering green technology which can be used to mitigate land erosion and stabilize the riverbanks and coastlines. The objective was to encourage participants, communities and other stakeholders to use this knowledge to protect and improve their assets and their surrounding environment for the benefit of all. An anticipated outcome of the project was an increased awareness of the potential of the VS resulting in its increased utilization to reduce erosion and flooding and rehabilitate degraded land.

The original plan included contracting Environmental Engineer, Jonathan Barcant of Ecological Engineering Solutions Ltd. (EESL), specialist in land and water rehabilitation, to conduct a 5-day workshop accommodating up to 40 participants per day, with 15 to 20 core participants fully

trained after attending at least 3 of the 5 days. Due to Covid-19 limitations imposed across the island, the workshop was pushed back until Nov 16th – 27th, 2020 and training sessions and hands-on demos were completed over a two-week period. Additionally, the number of daily workshop participants was limited as a Covid precaution.

It was anticipated that workshop participants would include a cross-section of people including farmers, householders, community members from the St. Andrew South East and Crochu areas, the construction industry, tourist industry and various Government Ministries. Workshop participants were to be educated in the many potential applications of Vetiver grass and the correct planting techniques used to optimize the effectiveness of this system.

Per their proposal, ESGI planned to develop two demonstration projects utilizing the VS under the guidance of EESL. One demonstration site involved the St. Andrew South East Development Organisation by using a Vetiver System installation to protect a community recreation area in Marquis/Soubise St. Andrew from rising sea levels. Another demonstration involved the St. Martin de Porres R.C. school, Crochu's 4H project. The plan proposed selecting participants from the communities and incentivizing them to maintain the demonstration projects for a period of 12 months after establishment, with supervision by ESGI. Signage at the demonstration site was planned to sensitize a larger audience to the effectiveness of the VS in land stabilization and erosion control.

In terms of meeting the needs of the demonstration site plantings and supporting the dissemination of vetiver grass and the VS as a useful technology to address soil erosion control, ESGI set out to ensure a readily available supply of 6,000 vetiver slips (young plants) for use at the workshop and demonstration sites. Slips not used during the project were to be gifted to the core participants to conduct a project of their own choosing after completing their training.

To increase the dissemination of knowledge from the workshop about vetiver grass and the VS, ESGI detailed a plan to create an ongoing source of information by way of documentation, videos and an online presence to reinforce and make more widely available the knowledge presented during the workshop.

Monitoring and Evaluation Process and Tools

Monitoring Process:
Monitoring of the ESGI GEF SGP Project took place over the period of 22 months from the launch of the project in April 2020 until the final days of the project in end of Jan 2022. Project monitoring included the following activities:

- Monthly meetings of ESGI personnel to share updates, and to discuss and plan for future activities associated with the promotion of vetiver grass and the vetiver workshop and demos,
- Periodic email or text (for those without email accounts) updates regarding the advancement of the ESGI project initiatives to the Implementation committee members (Cynthia Mc Donald (Office manager -Minister Emmalin Pierre and member of the St. Andrew South East Development Organization), Celia Edwards (Land use Officer Ministry of Agriculture), Rickie Morain (representative from the Ministry of Finance), and Joseph Noel (Land use Officer Ministry of Agriculture), Martin Lewis (community leader in Soubise) and Brian Hazzard (Gardener with the 4H program at the Crochu school), and Christine Ettienne, an extension officer.
- Formal project reports, along with informal email updates on the events and administrative activities associated with the ESGI Vetiver Project, completed and submitted to the National Coordinator, GEF SGP (Grenada),
- Production of a video (Oct 2020) to share the development of the vetiver nursery on Ocean Edge Farm to verify the propagation of young plants from existing mature vetiver hedges to ensure an adequate supply of planting material for the project: https://spark.adobe.com/video/GgWb0CiBpmavv, and
- On site visits to the demonstration sites planted during the ESGI Vetiver Workshop and to other sites planted by participants of the workshops.

Evaluation Process and Tools:
On the ground data collection and observation for evaluation of the ESGI SGP Project took place in Grenada between July 12 – 27th, 2021. Project evaluation, performed by Dr. Vanessa Slinger-Friedman – Professor of Geography at Kennesaw State University, was based on the following:

- Pre- and post-Likert scale surveys with workshop participants,
- In-depth focus interviews with workshop participants and the ESGI Team,
- Interviews with government representatives and other related entities,
- On site visits to the demonstration sites planted during the ESGI Vetiver Workshop and to other sites planted by participants of the workshops, and
- Attendance at a demonstration tent hosted by ESGI at the Mirabeau plant distribution opening ceremony.

Monitoring, Evaluation and Knowledge Management Results

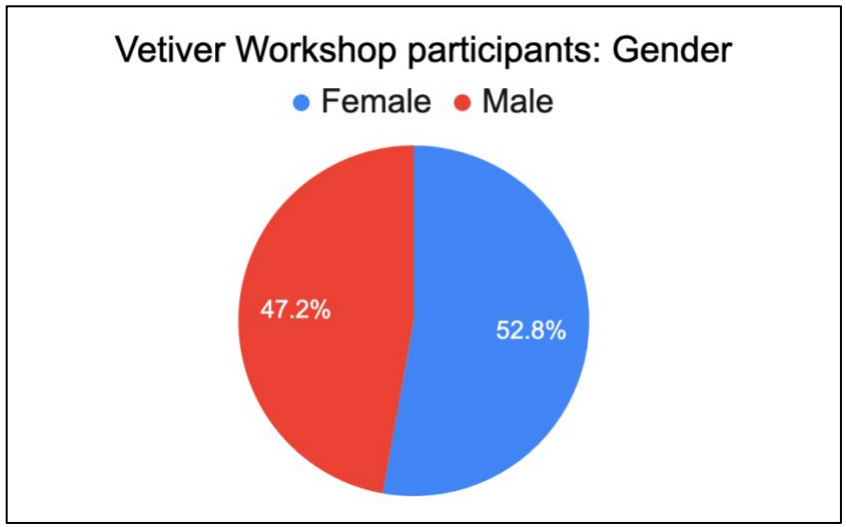
OUTCOME	ANTICIPATED PROJECT OUTPUTS	INDICATORS OF SUCCESS	MEANS OF VERIFYING	MONITORING AND EVALUATION: VERIFICATION OF PROJECT OUTPUTS RESULTS
To demonstrate & disseminate sustainable land management through the Vetiver System (VS) to vulnerable communities to empower them to protect against land degradation.	The propagation of young plants from existing mature vetiver hedges to ensure adequate supply of planting material for project. 6,000 slips produced for demo project & workshop. Unused slips granted to participants wanting to replicate the VS on their land.	Evidence that work is being done to produce new planting material to make vetiver slips for the project. 6,000 slips under production	• Photographs Project report	Video produced to share the development of the vetiver nursery on Ocean Edge Farm to verify the propagation of young plants from existing mature vetiver hedges to ensure an adequate supply of planting material for the project: https://spark.adobe.com/video/GgWb0CiBpmavv.
	40 Participants sensitized, & 15-20 core participants trained by qualified Eco-Engineering Firm Engineering Solutions Ltd. - EESL) in the VS & the correct application techniques. Pilot demo projects will demonstrate the effectiveness of the VS to a larger cross-section of the population & involve the local community in maintaining a structure which is protective of their environment.	• Establishment and maintenance of the demonstration projects in the communities. • # of farmers and other community members utilizing the VS. • # of additional linear feet using the VS for sustainable land management • # of workshop participants using vetiver to make handicrafts or involved in other vetiver related industries	• Photographs • Interviews • Project reports	• The VS Training Program Report by Jonathan Barcant listed 40 participants of the VS workshop in Nov 2020. The workshop included 7 handicraft production workshops, 1 soap-making demonstration, and 1 essential oil production demonstration. 20 workshop participants were exposed to handicraft training during the workshop, 8 of whom came away with an end-product. In the final reporting period (Jan-March 2022) 12 additional days of handicraft workshops were provided and 34 additional people participated. • Publicly available google drive with photographs from the workshop trainings and hands-on demonstration plantings (provided by Jonathan Barcant): https://drive.google.com/drive/folders/1AZbKVGJEMtcVwS3HyhCjsh6ntbrLmTNh. • Two demo sites initially written into the project proposal; final result was 6 successful demonstration sites created during & following the workshop • Total additional linear feet of vetiver grass planted with the VS using GEF SGP donated slips = 2,266 linear ft. This included 666 linear ft of vetiver grass (2000 GEF SGP donated slips) established during the workshop, and 1600 linear feet (4200 GEF SGP slips) planted after the workshop during the rainy season 2020 & 2021.

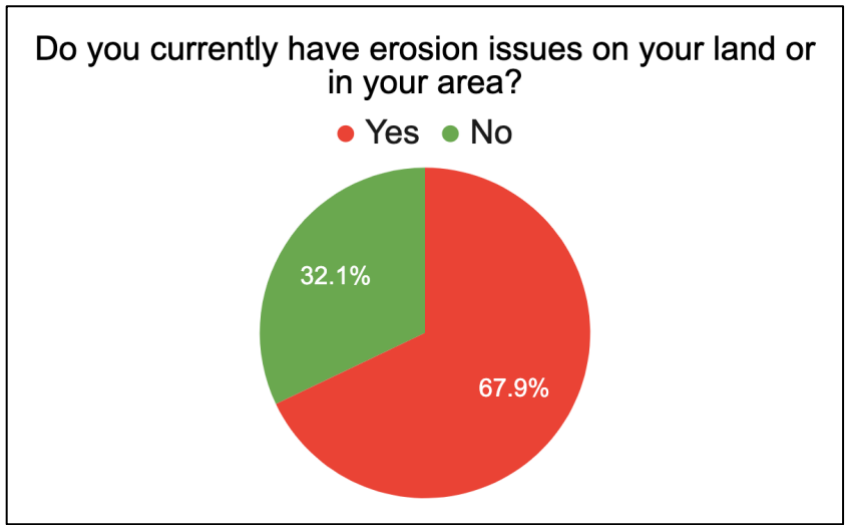
OUTCOME	ANTICIPATED PROJECT OUTPUTS	INDICATORS OF SUCCESS	MEANS OF VERIFYING	MONITORING AND EVALUATION: VERIFICATION OF PROJECT OUTPUTS RESULTS
				• Additional linear feet of vetiver grass planted using the VS based on interest from exposure to the website and sources of training and information materials = 833 linear ft (2500 slips). • In the final reporting period, an additional 2,500 slips were donated– 1,000 slips to Mirabeau nursery, 1,000 slips to a female farmer in Mardi Gras, and 500 slips provided to participants in 3 handicraft workshops. With these additional donations, ESGI's UN SGP sponsored project provided the opportunity for 914 additional of 914 linear feet. (All in all, based on the vetiver slips distributed, the project provided for 4,013 linear feet of vetiver to be planted in Grenada.) • Out of the 40 workshop participants, 7 participants (17.5%) have been identified as 'Vetiver Champions' meaning they are fully qualified to teach, implement, & maintain vetiver installations on their own. 5 of the 7 are involved in farming or agricultural activities.
	A handbook (digital and in print) will be created detailing all aspects of the VS and will also include information on self- employment opportunities for communities using vetiver & possibly the creation of new industries which would be of benefit to Grenada.	Handbook detailing aspects of the VS including correct method of creating planting material, how to make and use an A- frame, application of the VS, and methods of processing the vetiver plant material for use in handicrafts.	Project report with links to digital (online) handbook product	• Handbook (https://vetivergrenada.com/vetiver-handbook/) on the website Resources page. This flipsnack book was created by ESGI to provide instructions and essential information on propagation and planting using the VS. Several benefits of vetiver are presented including growing the grass for essential oils and handicraft production, and phytoremediation to deal with pollutants. It serves as a technical manual. • Handicraft brochure (https://vetivergrenada.com/vetiver-handicraft-brochure/) – available on the website Resources page. Describes the characteristics of vetiver grass and lays out the potential of vetiver grass for providing self-employment opportunities in the areas of handicraft making, essential oil production, and soap and perfume making.
	• A videotape, created during the workshop, will be available for ongoing educational purposes & used to involve a wider cross-section of the population.	Professional level video of the application of the VS made available on the ESGI website widespread distribution.	Project reports with links to the final training video product	• A Thin Green Line - In Grenada (A Thin Green Line - In Grenada (https://vimeo.com/589975013) – this video is a product from the Vetiver workshop and was produced by Film Producer, Lawrence Dupuis. This video is a useful tool to generate publicity for the UNDP's GEF SGP Program in Grenada, awareness of ESGI, and spread awareness of the availability of the vetiver system to a wider audience. • Vetiver Grass Training (Ministry of Agriculture, Lands and Forestry Grenada) (https://vetivergrenada.com/ministry-of-

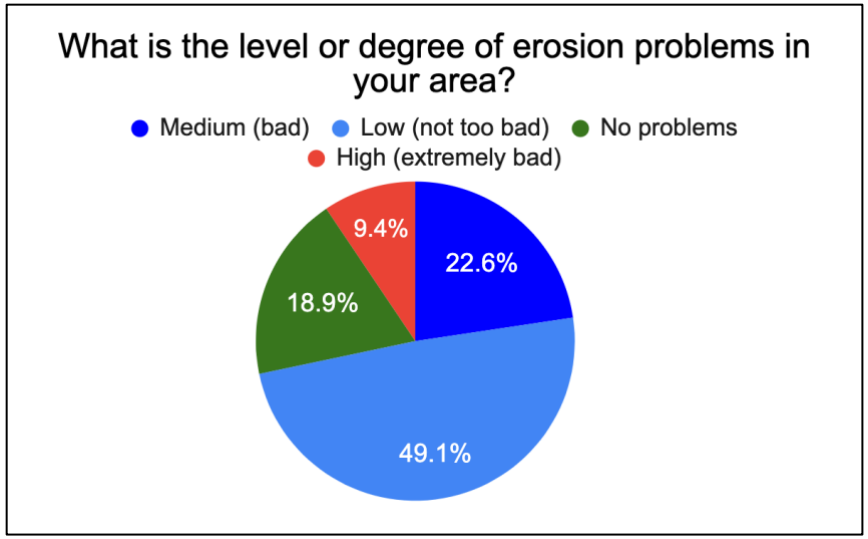
OUTCOME	ANTICIPATED PROJECT OUTPUTS	INDICATORS OF SUCCESS	MEANS OF VERIFYING	MONITORING AND EVALUATION: VERIFICATION OF PROJECT OUTPUTS RESULTS
	• A website & paper documentation will be a source information available to all those interested in promoting the VS in Grenada			agriculture/). The PR unit of the Ministry of Agriculture, Lands and Forestry Grenada attended the training and installation of the demonstration sites at the Crochu RC Primary School 4H garden, and the training of staff & installation of plants at Mirabeau propagation station. The video produced highlights the many benefits of vetiver and the potential of vetiver grass and the VS as an educational tool in primary and secondary schools in Grenada. • The Vetiver Grenada website (https://vetivergrenada.com/) has grown in followers
	Documentation to describe the project and highlight its impact in the form of project reports and possibly a peer reviewed academic paper to be submitted to a publication.	Project reports & potential academic paper to be submitted to a publication based on data collected in the pre- and post- workshop surveys & in follow-up interviews with project participants.	Project reports & potential link to academic paper if accepted & published in a journal	This M & E report serves as verification of this project outcome. The report will be modified into a manuscript to submit to a journal for peer reviewed publication. If it is successful, a link to the final product will be made available.

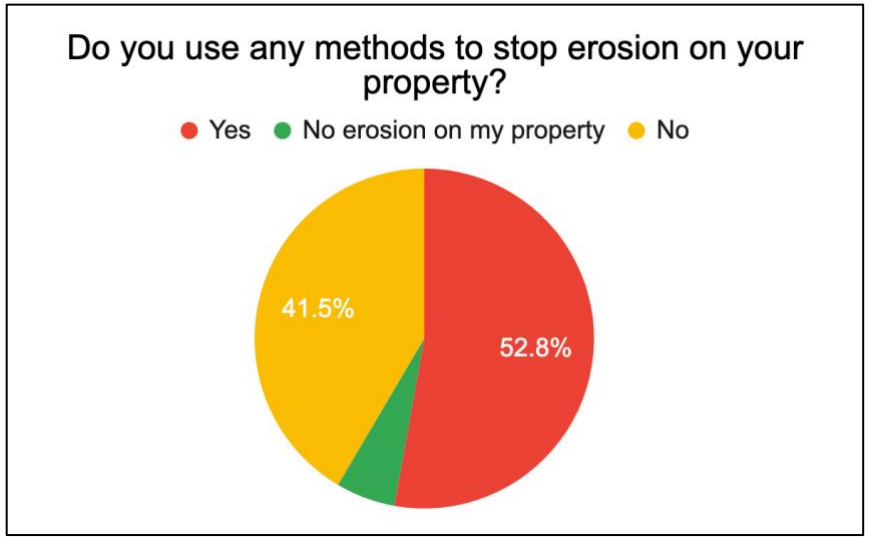
Evaluation of Knowledge Acquired from the Vetiver Workshops

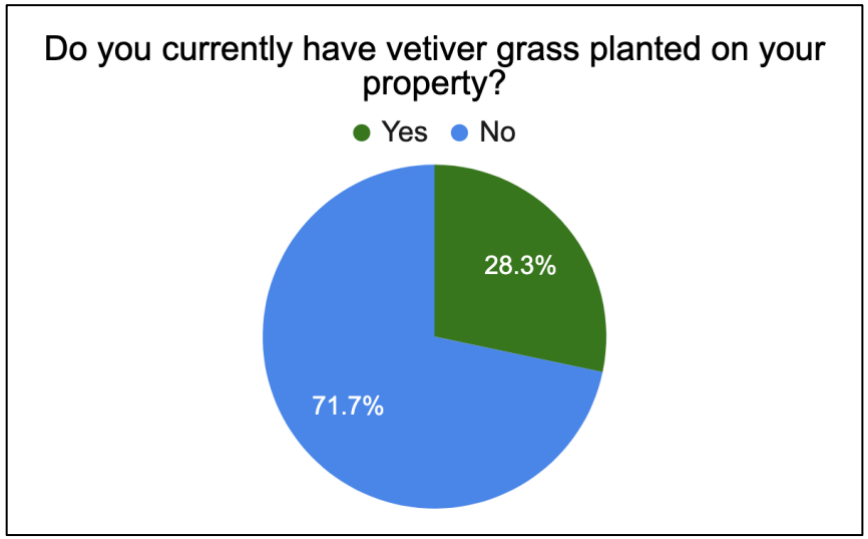
The Vetiver workshop took place in November 2020. The data below was collected from participants of the various components of the workshop, including the webinar session. The gender division of the survey respondents is just slightly higher on the female side. Over two-thirds of the respondents identified that they currently have soil erosion issues on their land or in the area where they live, with almost 10% of respondents stating that their erosion issue is high (extremely bad). Over half of the respondents said they had used some method to deal with erosion.





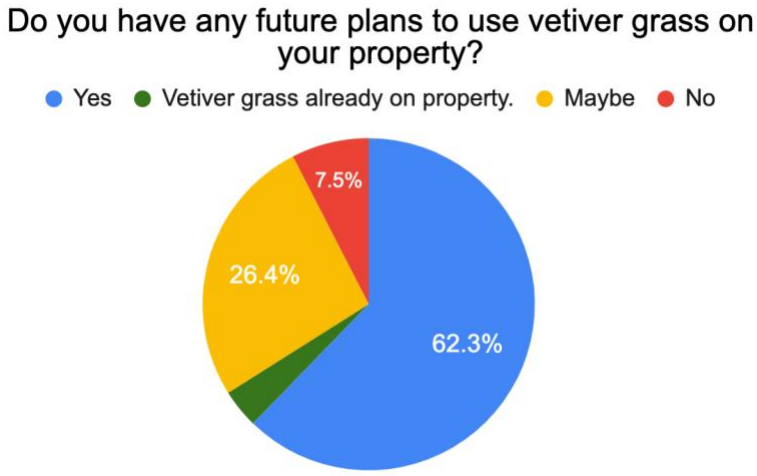
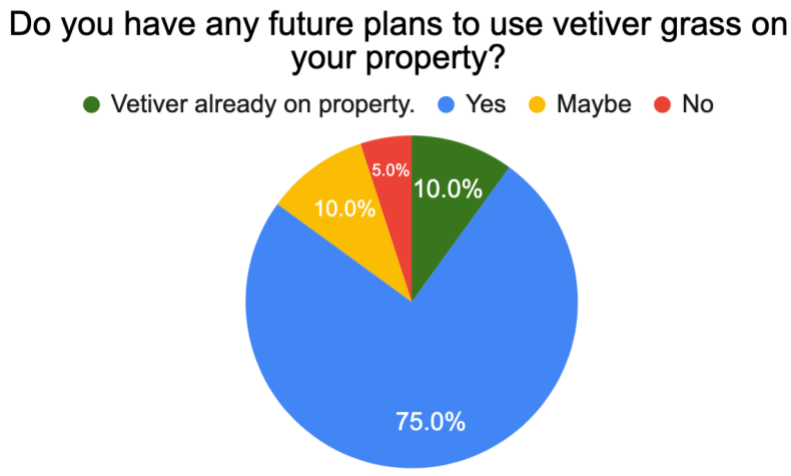






A majority (over 70%) of workshop survey respondents did not have vetiver already growing on their property. Two of the respondents who currently have vetiver growing on property responded that the vetiver on their properties had been there for 45 and 50 plus years respectively. These responses underscore the longevity of the plant. For those who currently have vetiver on property, the main purpose of the vetiver is to prevent soil erosion.

Data from pre and post workshop surveys indicate that workshop participants were successful in obtaining knowledge about the vetiver plant and the VS. A comparison of the responses to knowledge questions before and shortly after the workshop event(s) show this increase in knowledge about vetiver grass and the VS and indicate an increased level of comfort with using vetiver and the VS, along with a shift in desire to use vetiver as a tool in the fight to stop soil erosion (see table below).

Pre-workshop survey Knowledge & Use	Post workshop survey knowledge & Use
	
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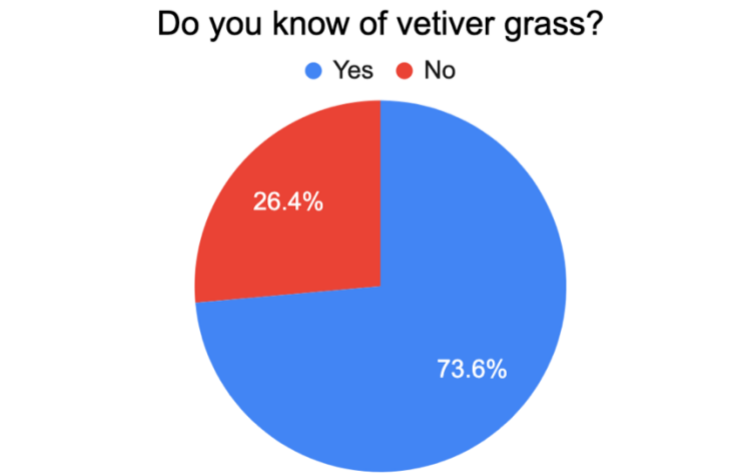	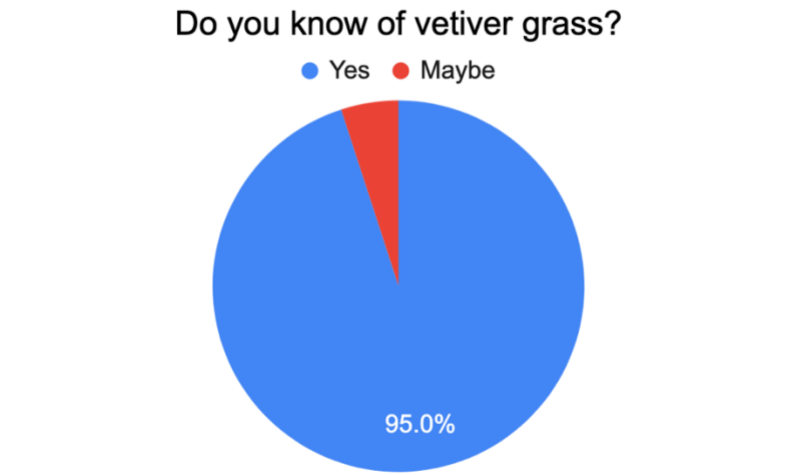

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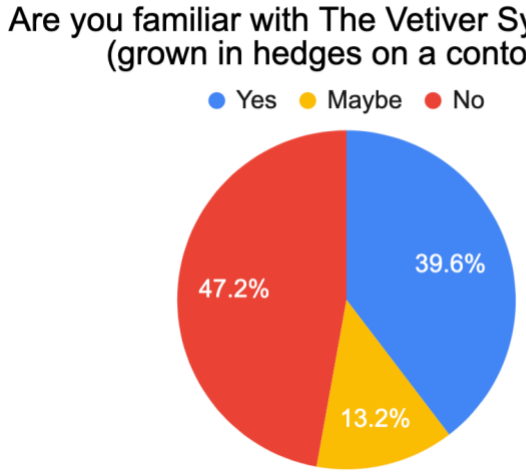	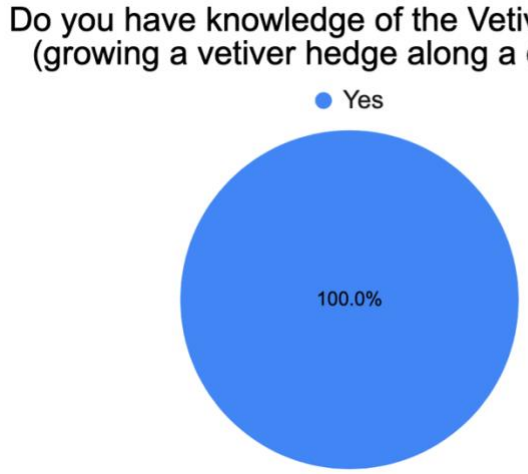
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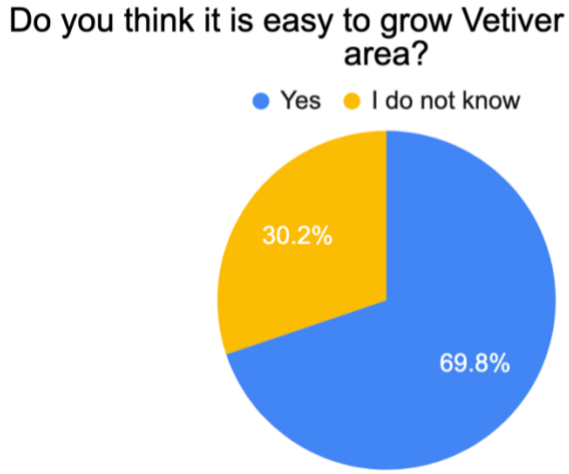	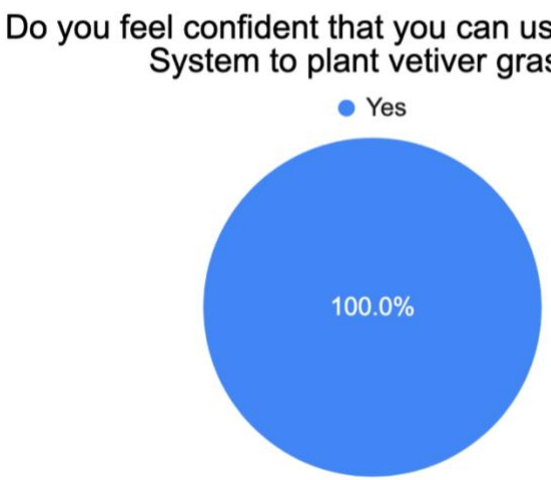

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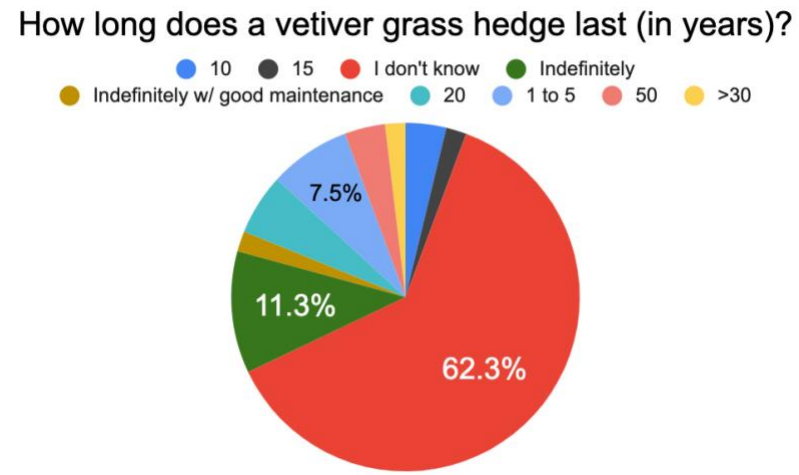	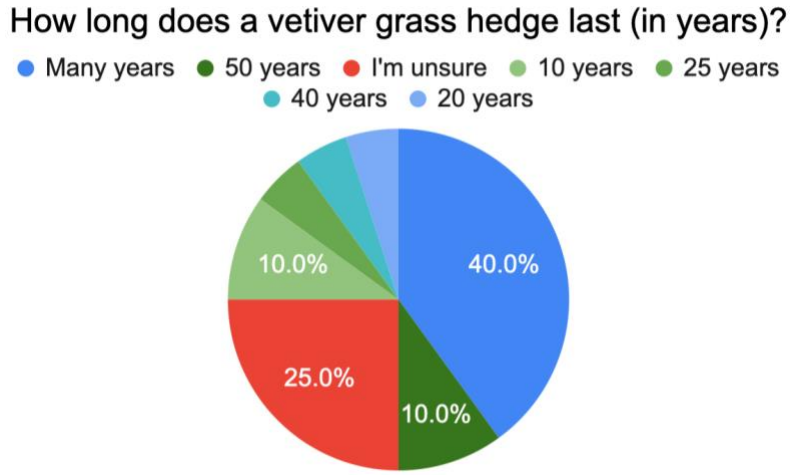
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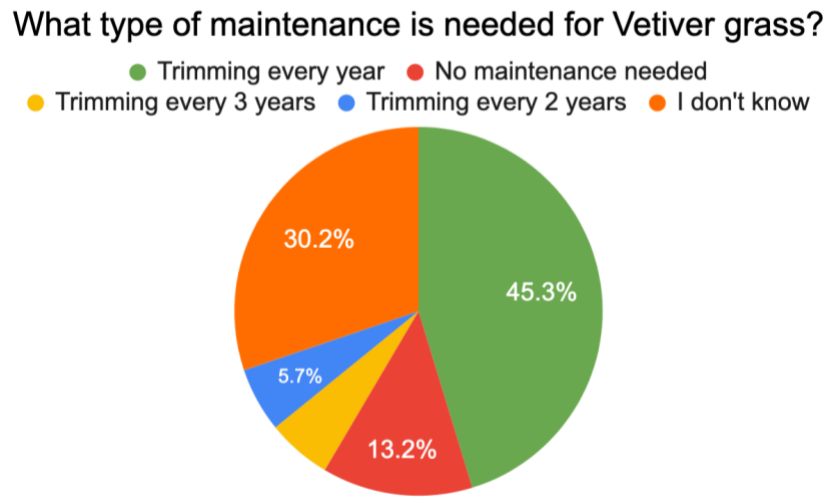	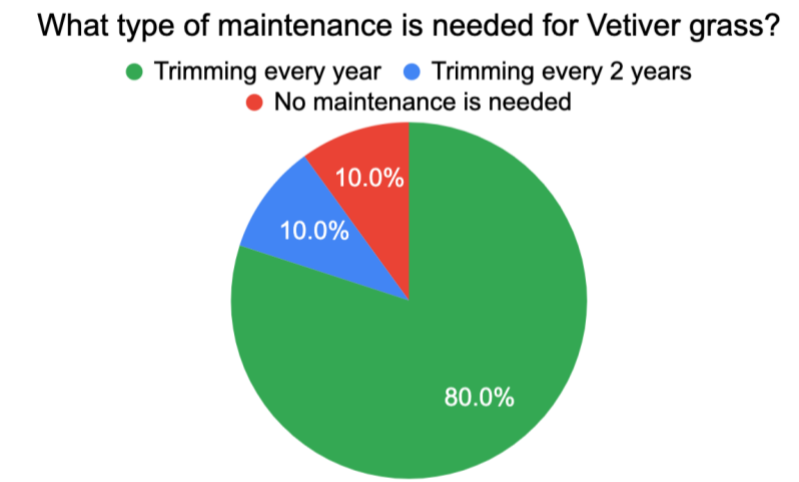

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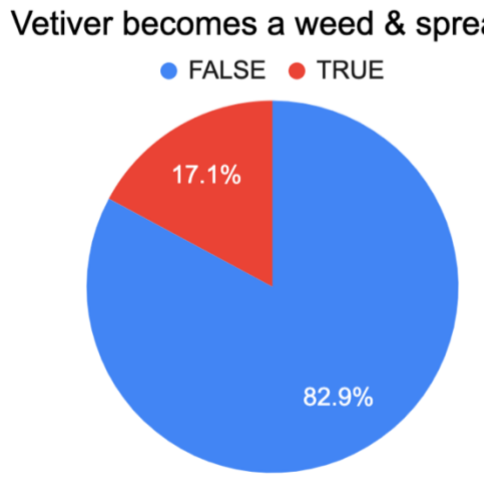	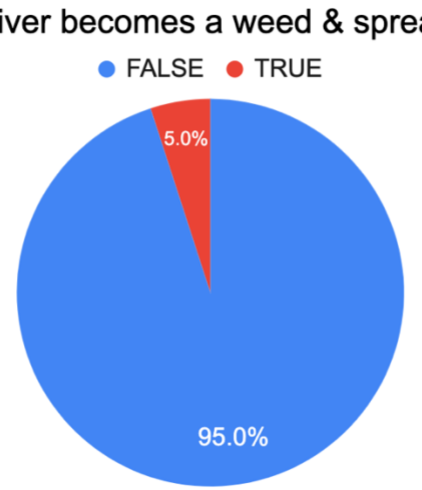
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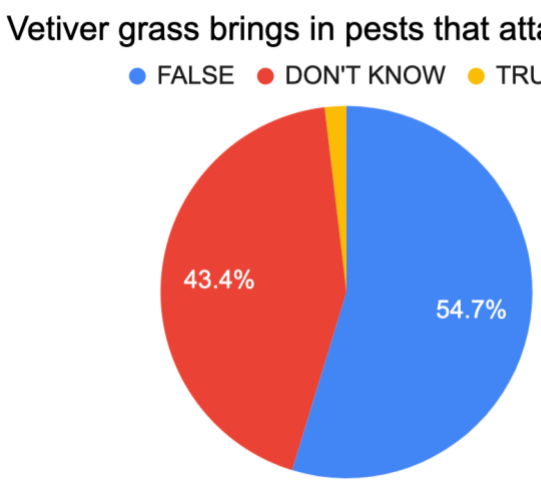	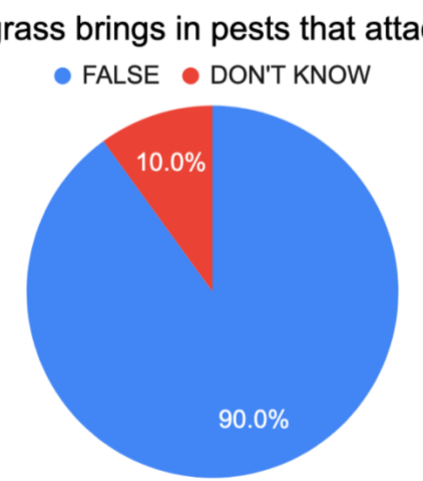

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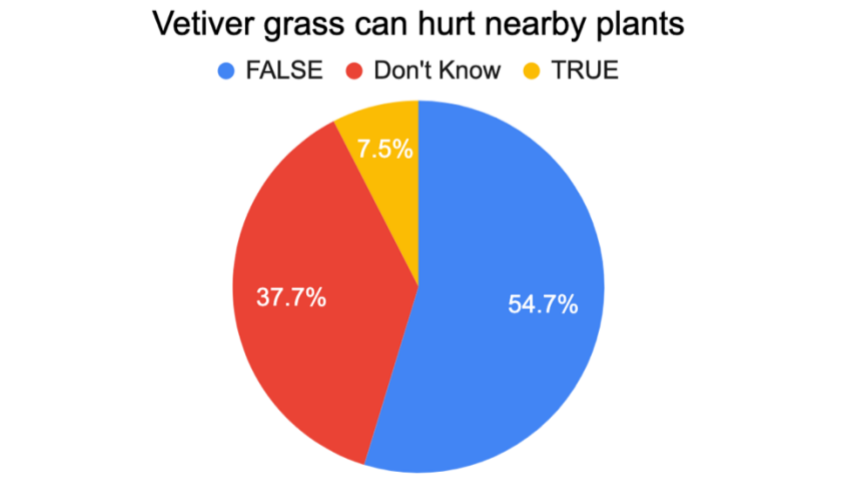
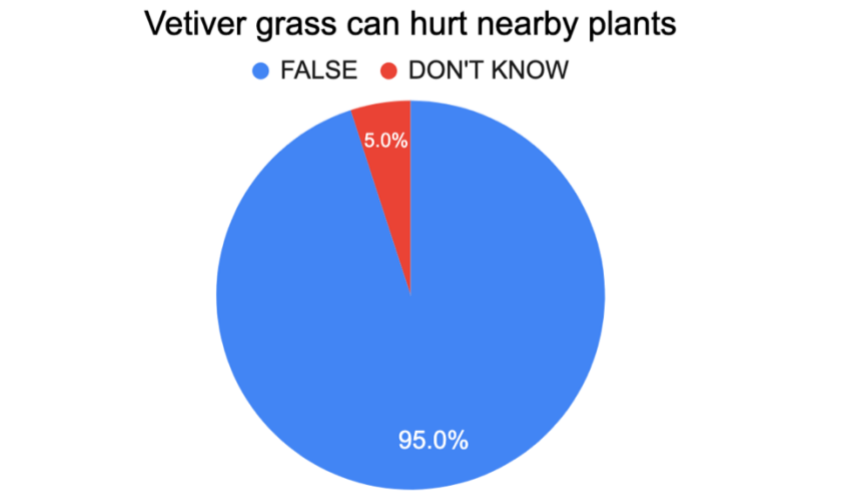
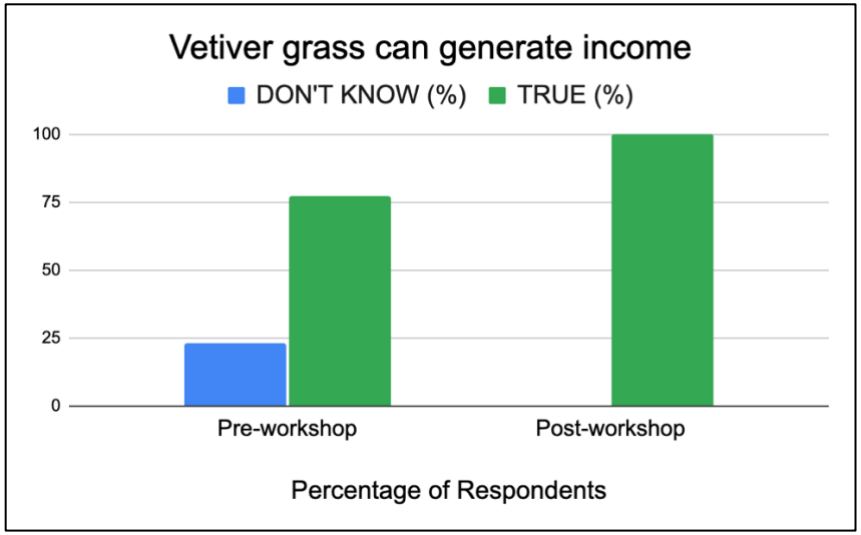
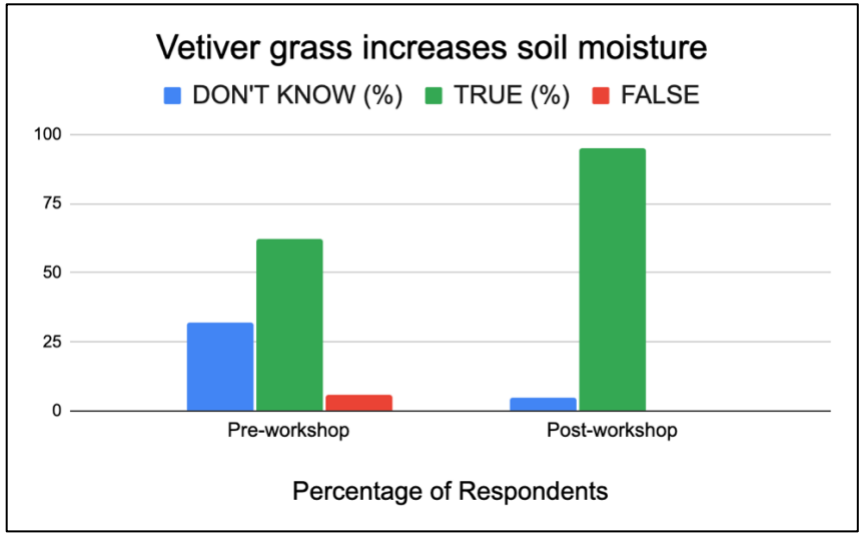
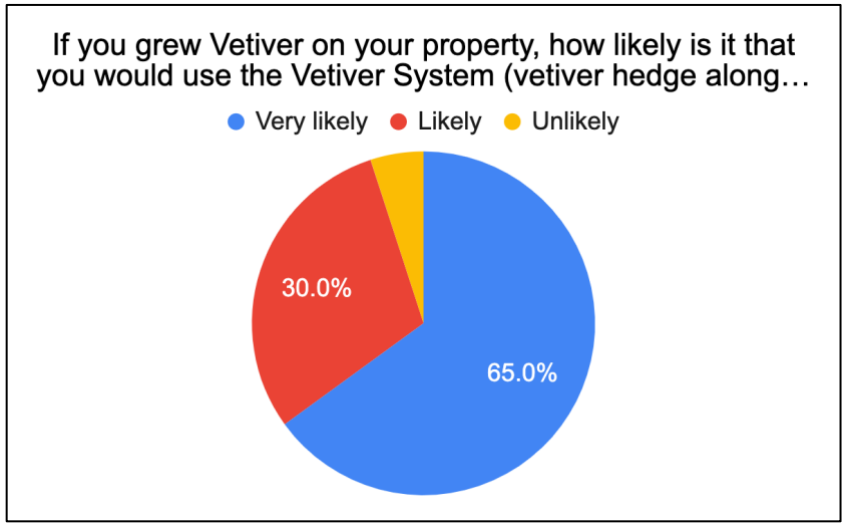
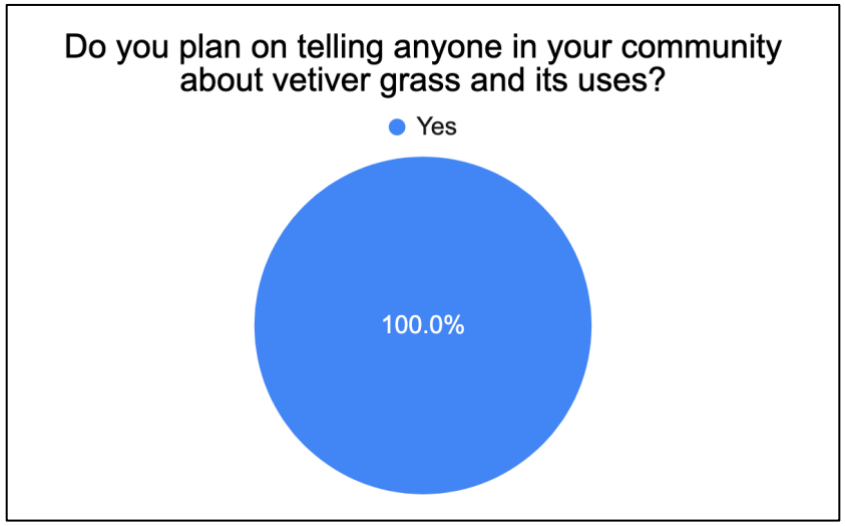
	





While already somewhat aware of the benefits of vetiver grass, workshop participants grew in their awareness of vetiver as a way to conserve soil moisture and to generate income. The importance of using the VS in planting vetiver grass to obtain maximum benefits was so effective that 95% of post workshop survey respondents stated that they would be very likely or likely to use the VS if they grew vetiver on their property. After participation in the Vetiver workshop, participants were very enthusiastic about sharing the knowledge obtained at the workshop sessions and 100% of the survey respondents stated that they planned on telling community members about vetiver and its uses. When asked what they would share about vetiver grass and its uses, several respondents mentioned the soil erosion properties of vetiver grass. Here is one specific comment shared that encompasses several of the sentiments expressed by other respondents regarding what they would share about vetiver, "I would share the many benefits of TVS, including the documentary films, facts sheets, and websites on best management practices with regards to slope stabilization, soil and water conservation among with uses. I'll also share the potential business opportunities that can be realized from vetiver grass cultivation."





Evaluation of knowledge retention - Long-term Post-workshop Survey Data Results

Eight months after the completion of the Vetiver workshop participants were asked to complete a follow up vetiver workshop survey. The objective of this activity was to determine long-term retention of knowledge about vetiver grass and the VS gained at VS workshop. Twelve of the forty (30%) original workshop participants completed the long-term post-workshop survey. In terms of the

demographic composition of the respondents - seven were male and five were female. They were from a wide range of ages (20s – 70s) and involved in a variety of industries including farming, agricultural extension, retail, government work, and tourism. All respondents had participated in either a vetiver workshop training session or a hands-on demonstration. Almost 60% of respondents had attended both a training session and a hands-on demo.

- 100% of respondents got all, or all but one, of the vetiver knowledge questions correct. (50% of the respondents got all of the vetiver knowledge questions correct. The other 50% of respondents only responded incorrectly to one of the knowledge questions.)
- 100% of respondents answered that a well-maintained vetiver hedge grown using the VS could last for many decades.
- 100% of the respondents strongly agreed that "You can use Vetiver to prevent landslides on your property or in your community from getting worse" and that "A well installed Vetiver System is planted in a hedgerow along a contour."
- 83% of respondent expressed an understanding that vetiver required some maintenance at least once a year
- The largest variation between respondents was in attitudes towards vetiver as a solution for erosion control came when it was compared to other physical structures like walls. For example, in the Likert scale question, "Physical structures (eg., walls) are more effective (better) than green/natural types of soil erosion control?" While 66% of respondents strongly disagreed or disagreed with this statement, 33% of respondents agreed with this statement, often taking time to qualify their attitude by saying something like, "It depends on the level of erosion," or "Sometimes a wall is better, but green erosion control is cheaper"

These data suggest that the participants retained a very high level of knowledge from the Vetiver workshop. The workshop clearly engaged them in a way that the learning about plant characteristics, plant benefits and plant care stuck with them.

<u>Vetiver Grenada Website Data</u>

An analysis of some general user data taken from the statistics section of the Vetiver website indicates that the Vetivergrenada.com website has been visited a total of 3,402 times by 1,241 visitors over its existence since April 2020 up to January 2022. This averages out to be about 154 visits/month. Interestingly, after the home page, the most visited page on the website was the one dedicated to the SGP project. It is good to note that the largest audience for Vetivergrenada.com website is Grenadians or others within Grenada, consisting of 539 of the visitors to the site. An additional 159 visitors to the site hail from fellow Caribbean Island St. Lucia. The strong local and regional interest in the vetiver Grenada website could be taken as a good sign for the interest in vetiver, this green alternative for soil erosion control.

Evaluation of Planted Demonstration Sites

The following provides an assessment of planted vetiver demonstration sites based on site visits by Dr. Vanessa Slinger-Friedman over a three-week period in July 2021, eight months after the completion of the Vetiver workshop:

Here is a list of demonstration sites that were created during the workshop period of the ESGI GEF SGP funded project:

- St. Martin de Porres R.C. School (Crochu) 4H garden and car park (planned)
- Marquis/Soubise St. Andrew – St. Andrew South East Development Organisation recreation area (planned)
- Mirabeau plant propagation station
- Keemo Vincent's pig farm
- Seabreeze Hotel in Grand Anse
- Yasmin Ali – Residential owner

Here are vetiver planting sites that were created/supported as a result of participation in one of the Vetiver workshop or training sessions put on by the ESGI or due to collaboration with ESGI:

- Richmond Hill prison
- KIDO foundation in Carriacou

St. Martin de Porres R.C. School 4H garden and car park (Crochu)

The demonstration site on a slope below the 4H kitchen garden at the St. Martin de Porres R.C. School was completed during the workshop and expanded to include additional hedgerows on the bank under the road in the period after the workshop. Currently, this demo site has vetiver hedges that are well established and well maintained under the supervision of Brian Hazzard, 4H gardener. Mr. Hazzard, one of the workshop participants, was paid a stipend to water, weed and look after the site until the end of the project.

When asked to share his feedback on the workshop, Mr. Hazzard indicated that he thought it was successful based on what was accomplished. He felt that he had gained a lot of knowledge. "Before we used to just watch it like an ordinary grass. Although we used to plant it on hedge, but we did not used to plant it the right way. Since I went in the workshop and stuff like that, I am more educated about it. I know how to plant it better so it can be more effective in preservation of soil and water management." Specifically related to the impact of the Crochu School vetiver demo site, he stated that they, "used to have a lot of runoff during the rainy season. We got better results this year with the vegetables (lettuce and cabbage)." The food from the 4H garden is consumed in the school feeding program. They were able to produce more vegetables this year for that program.



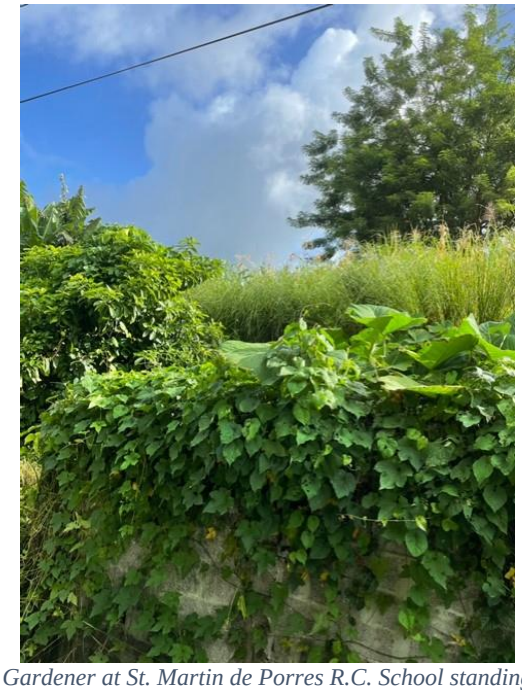



Figure 2 Images of (top left) Brian Hazzard, 4H program Gardener at St. Martin de Porres R.C. School standing in the 4H garden alongside a vetiver hedge and (top right) in front of a thick vetiver hedge that keeps the Crochu school car park free from mud coming down the bank when it rains. Additional photos (below) of vetiver hedges planted close to corn plants by the students at St. Martin de Porres R.C. School, and on the bank under the road.

The St. Martin de Porres R.C. School demonstration site is a huge success. It was well maintained and even extended by Mr. Hazzard. Due to the level of experience and expertise gained through this project, Mr. Hazzard is now considered a 'Vetiver Champion," fully qualified to teach, implement and maintain vetiver installations on his own.

Figure 3 Mr. Lyons, principle of the Crochu school, being presented by ESGI team member June Slinger with the portfolio of 20 laminated posters for teaching the children about Vetiver.

There is tremendous support for the project at the highest level of the school. School principal, Mr. Lyons, expressed an interest in establishing an area within the school where posters and other educational material supplied by ESGI could be made available to students. At the end of 2021, ESGI presented the principal, Mr. Lyons with the Ziploc folder of 10 double-sided laminated posters to use as a teaching tool for the children. Per the principal, they have plans for the sixth form students to do project on vetiver grass in 2022.

Marquis/Soubise – St. Andrew South East Development Organisation Recreation Area (St. Andrew)

The Soubise demo site was successfully planted during the workshop. Over the entire period of the project, different community members were paid a stipend to maintain this demonstration site to ensure its successful establishment, supervised by ESGI. The maintenance of the vetiver hedges was assisted by a water tank to collect rainwater for the plants donated by Ramdhanny Tru Value Hardware.

Figure 4 Dennis Wilson and another community member display water tank donated by Ramdhanny True Value Hardware to collect rainwater for vetiver plants in Soubise.

The condition of the site during an evaluation visit in July 2021, indicates that the vetiver hedges are alive but inconsistent in growth with some plants struggling, being brown or retarded in their growth. While some of the leaves are brown, the roots are strong in the ground, and it appears to be thickening in spots. The tide on this area of the southeast coast brings seawater all the way up to the main road regularly for weeks at a time. Due to intense inundation by direct sea water when the tide washes over, the vetiver is not doing as well as hoped.

Figure 5 Vetiver hedges at the Soubise Recreational Area are alive but inconsistent in growth with some plants struggling, being brown or retarded in their growth.

Figure 6: Vetiver plants with Naupaka planted on the sea side to reduce the sea blast.

Based on a recommendation by Dick Grimshaw of the International Vetiver Network, ESGI contacted Jason Fox of Vetiver Farms Hawaii who suggested planting naupaka behind the vetiver in an attempt to buffer the vetiver from the worst of the sea blast. This action was met with limited success. At some point a discussion was had about installing some large boulders to break the force of the water, but it has not been possible to do so for several reasons.

This demo has faced some challenges. The community members who make use of the recreation ground are all fishermen and as such have little or no interest in learning how to cultivate vetiver but seem intrigued and appreciative of the efforts being made to secure the future stability of the area. ESGI has pursued other green options, such as replanting some of the native vegetation that was removed previously, the removal of which increased the coastal erosion now being experienced. After a period of continuously replanting and maintaining this difficult area, a decision has been made by ESGI to maintain the best portion behind the gazebo.

Figure 7 A solid barrier shielding newly planted vetiver in Soubise from the harsh winds & salt spray. Naupaka planted on the sea side will create a top line of protection. When the vetiver grows it will obscure the fence.

ESGI has recently erected a 55 ft. long solid 3ft. high barrier behind the gazebo & replanted vetiver on the leeward side, Naupaka on the windward side and will be continuing their efforts to ensure the viability of this demonstration after the end of this project. The vetiver here is alive and will come back more fully in the wet season. Realistically, the vetiver at this demo site may struggle to thrive for some years due to high saline conditions until it can mature. ESGI has certainly made every effort to ensure that this demo succeeds.

Figure 8 Education and Sponsorship Signage for GEF SGP supported ESGI Vetiver Project erected in Soubise Demo Area.

The signage for the Soubise Demonstration is now erected at the site (Fig. 8). It will broaden the community's awareness of the UNDP's GEF SGP sponsorship of ESGI's work with vetiver grass to protect their vulnerable coastline. Additionally, it provides information about the benefits of vetiver grass and potential opportunities for income and employment related to vetiver grass, including handicrafts and essential oils.

Mirabeau Plant Propagation Station (Mirabeau)

During the Vetiver workshop in November 2020, one of the additional sites that ended up being planted as a demo by Jonathan Barcant and the ESGI team was Mirabeau Plant Propagation

Station. At that time, they demonstrated how to make vetiver slips from clumps and they planted a small, eroded section on a slope by a greenhouse. Workers and extension officers were trained. Jonathan also demonstrated how to utilize an A-Frame. He used laminates to explain the process and benefits of vetiver to them.

An in-depth interview with Allison Haynes, Agronomist and Manager of Mirabeau Station, revealed that the vetiver hedge had been established to reduce erosion and land slippage in an area where the soil had been dug up to set up two greenhouses. In an initial attempt to deal with the erosion they started building a stone wall, but they discontinued the wall because the stones were too heavy. They only have manual labor and some of the stones needed a machine to move. Ms. Haynes expressed concern over land slippage in Grenada and the negative impacts on farmers and homeowners. She referred to vetiver grass a low-cost solution that people are familiar with, as well as being viable, sustainable, easy to establish and not labor intensive. When asked for feedback on the ESGI workshop Ms. Haynes responded that the workshop had impacted her attitude toward the use of vetiver grass for soil erosion control because the presenters had used some incredible pictures, for example showing the depth of the plant's roots, and explained how the grass is used. She saw the value in vetiver because she found vetiver esthetically pleasing while it also keeps the land from eroding.

The establishment of a vetiver demo site at the Propagation Station is an important and relevant one. Mirabeau Propagation station is the source of planting material for the farming community and many households, as well as a training and extension site for many Grenadian farmers. In July 2021, ESGI provided Mirabeau with an additional 300 slips to establish a vetiver nursery. Currently, the willingness to propagate vetiver plant material appears to be strong as indicated by Ms. Haynes' statement, "Mirabeau station, as a propagation unit, can provide the plant material. That's what we do."

My first assessment was that the vetiver planted during the workshop was struggling and needed maintenance. However, a more recent visit in February 2022, indicates that the nursery is flourishing. Both Ms. Haynes and Mr. Gibbs were very enthusiastic and grateful to get more vetiver. In February 2022, a further 1000 slips have been donated and planted at Mirabeau. In terms of correctly utilizing the VS, planting vetiver in a hedge along a contour, the outlook is very promising. Ms. Haynes experienced the use of A-Frames at the ESGI workshop. As a result, she ordered ten A-Frames for the Mirabeau Propagation Station to encourage the proper planting of vetiver. There are four Districts in Grenada, Ms. Haynes mentioned that they will provide two A-Frames for each district and keep two at the Propagation Station to help farmers who come to the station.

Figure 9 (Left) The first attempt to stabilize the area next to the new greenhouse involved placing large rocks on the slope. This method was too labor intensive and did not work.

Figure 10 (Right) The second photo shows the planting of the demo vetiver grass in a hedge along the side of the greenhouse.

Figure 11 (Left) Vetiver grass hedge 8 months after initial planting indicates little to no maintenance or weed control in the surrounding area.

Figure 12 (Right) An A-Frame tool to be used to mark the land contour to ensure correct implementation of the VS (for vetiver and any other plant material).

In an attempt to further the dissemination of the knowledge of vetiver and the VS, ESGI signed up to host a demo tent at the event at Mirabeau Propagation station to mark the start of plant distribution which attracted a lot of attention, in particular from the Minister of Agriculture, Hon. Peter David and the new head of MNIB, Ms. Afia Joseph.

Keemo Vincent's Pig Farm (Gouyave)

During the workshop, Jonathan Barcant and members of the ESGI Team had the opportunity to work with Mr. Vincent to establish vetiver using the VS on his pig farm in Gouyave. As shown in the images, Keemo's farm is located close to a flowing river, and the pig farmer had expressed some concerns of the potential downstream impact of the pig effluent from his farm entering the river. The initial planting included 500 vetiver slips planted in contours to slow down and divert the pig waste from entering the river.

Figure 13 Images from Mr. Keemo Vincent's piggery showing the pigs, an area of pig effluent, and the nearby river which he is trying to protect from pollution.

On a subsequent visit, ESGI donated another 350 slips and worked with the farmer to establish some additional hedges. That intervention is really having a positive impact on stopping the piggery effluent from polluting the nearby river. This demo is important as a lot of pig farms in Grenada are situated close to rivers and effluent run-off is a problem that needs to be remedied. This is a good example of what can be done. Prior to the workshop and development of the demo on his farm, Keemo had no experience of vetiver grass. In the interview he stated that the workshop had taught him how deep the roots go down and that it is a good plant on a slope, and it can save your land. Keemo is an ambitious and entrepreneurial person, and he has plans to expand his piggery in a number of ways which will also involve the expansion of the area that he has planted under vetiver. At the end of the interview when asked if he wanted to share any additional information Keemo said, "We should continue to

push vetiver as a group. Grenada is blessed but we need to protect it, especially in the dump area to protect the sea and marine life. We need to put it in areas that is highly polluted."

Figure 14 Pig farmer Keemo Vincent with his mature vetiver hedges.

Figure 15Newly planted vetiver slips on Mr. Vincent's farm to extend the VS hedges to slow the flow of pig effluent to the river

Current and intended uses of vetiver grass at this site include: soil erosion control, border demarcation, slope stabilization, terrace formation, soil and water conservation, landslide stabilization, fodder and grazing, stuffing mattresses, maybe a thatch roof.

Challenges identified: Mr. Vincent stated, "Knowing the grass itself now – it is easy to plant." However, he expressed that the challenge might be the amount of material needed (sourcing the vetiver slips)

Seabreeze Hotel (Grand Anse)

Seabreeze Hotel is a tourism establishment located close to Grand Anse beach, one of the premier beaches in Grenada and a popular tourist spot. The vetiver slips donated by ESGI for this planting create two hedges of a combined 40 linear feet. The grounds caretaker, Mr. Justin Lewis, participated in three days of the vetiver workshop which Justin said was, "straight forward."

The vetiver is located behind the hotel, and it is healthy and growing very well. It had been trimmed correctly, cutting it at about knee height. The vetiver was planted to stabilize a crack in the retaining wall that is behind the hotel. It appears that Mr. Lewis is dedicated to taking care of the vetiver. He mentioned that he provided some water for it during the initial dry season when it was being established, but that once it caught, it was not an issue. They plan to establish another vetiver hedge a little higher up the slope. Additional vetiver slips were donated to Seabreeze Hotel in July 2021.

Figure 16 Images of Vetiver hedge stabilizing hillside above Sea Breeze hotel in Grand Anse

Residential Site - Yasmin Ali (Calivigny)

The housing site of a recently built home of a workshop participant was one of the installations of the VS by Mr. Barcant and the ESGI team during the workshop. The house site is on a hillside that was cut into to create the building site. The owner has used other forms of soil erosion control including a wall and terraces, but there is also quite a bit of vetiver. In an in-depth interview with Ms. Yasmin Ali, she mentioned that she knew about vetiver prior to the workshop, and she had been looking for the roots. She grew up seeing it sold in the market and liked its smell. Due to the demo installation, some very steep bare slopes on her housing site were planted with vetiver using the VS to stop significant soil erosion and slope slippage. She is planning on planting more vetiver at the back of the house where there are erosion issues. In terms of vetiver being viewed as a low-cost solution for infrastructure projects, this was supported by information from Ms. Ali who compared the cost of building a wall on her property to using vetiver grass for soil erosion control as she had done more recently. She said it cost thousands of dollars to build the wall versus the hundreds she spent to install the grass. She had already communicated with a neighbor about vetiver and what it could do for his erosion issue being that he had also built his house on a steep slope.

The workshop occurred during the time that Grenada was under threat from Covid-19 and the island was under strict rules for social distancing and limiting the numbers of people gathering. As a result, Yasmin could not attend all of the workshop days and, when asked for feedback on the workshop, she expressed that she felt slighted since she believed that people genuinely interested in vetiver should be the ones who should be able to participate in the workshop for all the days. Other than that, she stated that the workshop was well done. She thought that the demo was good also. Yasmin received a considerable number of free slips donated by the

project and the benefit of having a lot of them planted by other workshop participants, under the supervision of the vetiver specialist, Jonathan Barcant.

Current and intended uses of vetiver grass at this site include: erosion control, slope stabilization, landslide stabilization, terrace formation, border demarcation, medicinal oil, and soil and water conservation. She originally intended to use it for making perfume and would like to do this in the future, but she feels this is challenging.

Challenges identified:
Outside of the period of the workshop when she received free slips and free labor to do the initial planting, she stated that due to health issues, she had paid someone to do more planting of vetiver. She had no other challenges. She planted in the rainy season so it could be more successful.

Figure 17 Images showing VS demo installation in Nov 2020 on very steep bare slopes on a housing site (image provided by J. Barcant). Followed by a photo taken in July 2021 showing well established vetiver hedges stopping significant soil erosion and slope slippage.

KIDO foundation - slips for the restoration and reforestation of a hillside/watershed area (Carriacou)

According to their website, KIDO is a not-for-profit organization, established in 1995, which monitors and protects critically endangered nesting sea turtles and their habitats, carries on youth environmental education and conservation practices, and trains turtle/nature local guides. The KIDO foundation seeks to preserve the island's ecosystems and biodiversity with conservation activities and environmental research. These activities include planting trees to maintain the forest ecosystem. Locals and tourists visit the forested areas in the High North of Carriacou.

Figure 18 Locals and tourists visit the forested areas in the High North of Carriacou for nature-bound activities.

KIDO representatives Dario and Marina attended the online vetiver grass webinar presented by Jonathan Barcant in November 2020 and subsequently reached out to ESGI to obtain a donation of 900 vetiver slips and also additional information on planting. They have used the vetiver grass in three High North sites for two purposes: (a) restoring a watershed area by securing the banks of a newly created rain pond in the High North established to support diverse animals in the area, and (b) planting along stretches of the South contours of High North Hill to support and secure steep and eroded slopes, especially at areas that are major lookouts for tourists, including hikers. They used the vetiver to help create small terraces to retain as much soil runoff as possible.

Figure 19 Vetiver securing the banks of a newly created rain pond in the High North established to support diverse animals in the area

Later in 2021 KIDO again reached out to ESGI and obtained 200 more vetiver slips to expand the Vetiver lines up in High North. At this time also one of the Kido team members, Jahmal, 19, used some of the donated vetiver slips to start a Vetiver nursery, utilizing rainwater from a discarded stone cistern, where his family lives, in south Carriacou to support this small-scale nursery. KIDO foundation has had some setbacks with cows trampling the vetiver around the pond and a fairly dry rainy season but are enthusiastic about continuing to plant more vetiver next rainy season.

Figure 20 (Left) KIDO Guides pointing out Vetiver slips on the High North Trail in July 2021 (Carriacou).

Figure 21 (Middle and Right)Updated (Jan 2022) photos provided by Dario Sandrini showing established vetiver hedges in High North at the KIDO project.

KIDO has now incorporated education about the vetiver grass within their guided tours. Their nature guides describe to their hiking visitors the role that vetiver plays in containing the High North erosion problem and its other multifaceted uses. KIDO offered to post a sign provided by ESGI (see Fig. 23). This type of signage is an opportunity to have their visitors learn about Vetiver as they hike past the rows planted using the VS. This approach educates visitors, both local and foreign, about what can be done by this NGO to deal with the environmental and ecological problems faced on tiny Carriacou.

Figure 22 Sign posted by KIDO in recognition of vetiver slip and technical advice provided by GEF SGP funded ESGI Vetiver Project

Collaboration with Richmond Hill prison – Her Majesty's Prison (St. Georges)

Richmond Hill prison was not officially slated as a demo for the ESGI SGP. However, they had their own GEF SGP funded project with vetiver written in and Kadijah Edwards from the Grenada UNDP office asked ESGI to advise and help that project. Albert Buckmire, ESGI team

member, initially went to advise them and then Jonathan Barcant visited them during the workshop to give advice and training. Vetiver slips were donated on a subsequent visit.

During an interview with prison social worker and manager of the Richmond Hill prison GEF SGP funded project, Christopher Stroude, he mentioned that he was told by Christine Braithwaite, whose father was a doctor at the prison, that vetiver had grown along the contours on the opposite hillside because the prison used it in the past. Over the years, many officers did not understand what it was and its importance, so they cut it and dug it out. Animals do not eat it regularly, so they probably thought it was not worth saving. Presently, they want to establish a vetiver nursery and plant vetiver at the prison for several purposes: soil erosion control around their fish dam, slope stabilization, bioremediation of gray water, and treatment of chicken and pig effluent. Another project that they would like to establish is one in which short-term inmates obtain handicraft and essential oil making skills using vetiver, to increase their options for employment after leaving prison.

Figure 23 Inmate using bamboo to prepare the vetiver grass slips for planting in a contour line.

Figure 24 Initial vetiver grass planting around the fishpond in Richmond Hill prison (Nov 2020)

The significance and impact of the assistance provided by the ESGI team is demonstrated by this statement from Christopher Stroude, “We had put down some vetiver down before, but we were not getting what we wanted. Once Albert (ESGI team member) came in and they start showing us exactly how to plant, it made a big, big difference.” Furthermore, Stroude stated, “The training on how to cut and how to use was critical for us, before we might have wasted without knowing how to use it” (In-depth M & E interview with Christopher Stroude).

According to Mr. Stroude, the vetiver grass has helped in terms of holding up the bank of the dam where they keep the fish, and it has stopped the erosion. They learned from Jonathan that vetiver grass can be used for purification purposes (bioremediation), so they are building a system to filter the gray water using vetiver. Previously they had put lilies in the dam but one of the problems is they grew very quickly and covered the dam, and it stifled the fish.

When asked to provide feedback on the workshop and demo activities, Stroude stated, “Truly, I do not think there was much more they could have done.” Christopher also mentioned that the young man who had been trained was running with the initiative and, “could even make a business out of it by selling plants to people who want to put it by their house.”

Figure 23 Right: Update (Jan 2022) well-established vetiver hedges around the fishpond stabilizing the bank and preventing soil erosion. (Photos supplied by Christopher Stroude, Social Worker, Richmond Hill Prison).

Current and intended uses of vetiver grass at this site include: erosion control, slope stabilization, terrace formation, soil and water conservation, landslide stabilization, fodder for pigs, and handicraft material and perfume in the future.

Challenges identified: sourcing the vetiver slips, training of the inmates and prison guards, obtaining or building a pontoon to create the purification system to process the gray water, and obtaining handicraft training.

Other Related Interviews

Trevor Thompson, Ministry of Agriculture, Senior Land Use Officer (at the time of the interview)

Mr. Thompson is an enthusiastic supporter of the potential of vetiver grass usage in Grenada by farmers and in other projects with an environmental impact. i.e. the GCREWS project. Mr. Thompson has been to the demonstration site and is familiar with vetiver grass. Additionally, Mr. Thompson works with the UNDP SGP selection committee. When asked if he was aware of the outcomes from the vetiver grass workshop, he responded that the extension officers had mentioned it and that they were sharing the information with farmers. He said that the Ministry of Agriculture are interested in the potential of vetiver grass.

Mr. Thompson was asked about any current or future projects (in 2021) in the works that would involve using vetiver grass and the VS. He responded that none were currently planned and that "maybe in 2022" they could be. In terms of propagation station in Mirabeau being involved in the propagation of vetiver for dissemination, he stated that the agronomy division, in particular Mr. Gibbs and Ms. Haynes, would be the ones to spearhead such efforts.

In terms of challenges, Mr. Thompson said that he saw the quantity of vetiver planting material as a limiting factor and that the propagation station at Mirabeau and the Forestry Ministry could play a role in addressing this limitation.

Mr. Thompson mentioned that vetiver and the VS does not require a lot of resources but has a lot of benefits and that the visibility of the crop needs to be enhanced through closer linkages with extension to develop knowledge with targeted activities. Mr. Thompson suggested that training through the Ministry could happen after the UNDP SGP Grant is completed. He stated his commitment to including vetiver in Climate Smart projects and expressed the need to have a farmer demonstration in a badly eroded area.

In the interview Mr. Thompson stated that from his perspective the top priority of vetiver should be:

(1) To combat desertification, soil erosion, and landslides on farms
(2) For use by engineers for roadside infrastructure
(3) Commercial value – to develop the economic potential for Grenada where skills need to be developed and it should be a value-added product, not exported as a raw material.

To achieve the above Mr. Thompson put forth the following ideas:

(1) The need to increase propagation at the propagation stations
(2) The need to address the visibility of vetiver through continuous activity, demonstrations, and training.

Ing'utu Buckmire, workshop participant making and selling soaps and creams

Mrs. Buckmire stated that before the workshop she had never made soaps. Making the soaps gives her a good feeling. She wants to do an organic process and make sure her products are good quality. She wants to put the essential vetiver oils in creams and soaps because of the health benefits. Right now, she is the only person in Grenada making the soaps with essential vetiver oils and she knows that she will have a market in Grenada. In fact, when she attended the demonstration tent at the Mirabeau plant distribution opening ceremony, she experienced a significant interest in products using vetiver essential oils from others at the event. She plans on making more vetiver products and wants to be known for using essential oils. She may also try to make products using coconut oils.

While she would not mind getting more into the vetiver handicrafts, her real passion is making soaps. When asked about challenges, Mrs. Buckmire stated that she had ample access to the vetiver plants, although a large amount of the vetiver roots from plants that are 12 – 18 months in age, are needed to make even a small amount of oil. She identified her major limiting factor as the lack of access to a distiller to make the essential oil.

Since the workshop, Mrs. Buckmire has talked with friends around Grenada about vetiver. She planted some vetiver at her home region of St. Paul's to deal with soil erosion issues.

Feedback from workshop:
She stated that she believed the workshop was a success. Even though she knew about vetiver prior to the workshop, this was the first time she realized that "this is a magical grass" that can be used for the purification of water. Personally, she felt it was good to meet like-minded people. She would like to network beyond the workshop, but this has not happened yet.

Ways that the workshop could be improved:

- It might have been more effective it could have been more interactive versus more lecture based
- The time of the workshop was short, especially the time for handicrafts
- They needed more expertise in the handicrafts making
- The focus was on farmers, and it could have benefitted from more advertising for handicrafts making
- People who were expected to spread the word of the workshop to the community were not as helpful as they could have been in her opinion
- The pandemic limited numbers and not all the people who signed up attended

Post-workshop how to get the word about vetiver out?

- Representatives from Government are more connected and should be involved in getting the word out, help plant in people's homes, and go back to the farmer participants to follow up with them and encourage them until they get to the stage that they see the beauty of it

- People seeing the demo projects will help get the word out
- One on one follow up with the workshop participants is very important

Sahai Gibbs, Ministry of Physical Planning (at time of the interview)

At the time of the workshop, which she attended, Ms. Gibbs worked at the Ministry of Infrastructure and Development. Ms. Gibbs completed two days of the workshop. Subsequently, Ms. Gibbs went to work for Physical Planning. After the workshop, she introduced others to vetiver grass and made a recommendation to Mr. Kimo Andrews and Mr. Blache to get into contact with Jonathan Barcant to follow up on the potential of vetiver grass and the VS for the use in infrastructure and development projects in Grenada.

Ms. Gibbs saw the Crochu school demonstration and attended the workshop. She stated that in her opinion the relevant persons attended, and it was a "good workshop". She also mentioned that the workshop was "interactive". She obtained a wider knowledge of what vetiver can do.

Question: What will it take to get vetiver and VS included as part of infrastructure and development?
It will take knowledge and exposure with people working in infrastructure. It is especially relevant in areas where it is not feasible to use gray (eg., concrete) infrastructure. For instance, they could see improvements with the use of vetiver in infrastructure on the western side of Grenada where landslides and rockfall are frequent. In the past 30 years, this part of Grenada has experienced an increasing amount of floods. It would be helpful to take vetiver and the VS into consideration with future infrastructure planning. Vetiver grass and the VS should be encouraged and welcomed and may save lives. Grenada is not well developed, and it is cash strapped. Zones in the southwest of the country should be identified and recommendations made to include vetiver.

Rena Noel, Agriculture Officer who interacts with extension agents

Ms. Noel attended two days of the workshop and saw a video of a demo planting. She found out about the workshop through her job as an Agriculture Officer who interacts with extension agents. As someone involved in agriculture, she knew about vetiver grass as "razor grass" but did not know if its benefits. For instance, she mentioned learning that when vetiver is contoured, it decreases soil erosion and that it creates a 'wall' to protect land and stop land slippage. She is now also aware of the fact that vetiver can be used for crafts, essential oils, soaps, and creams. She is interested in doing another class and further her education about vetiver.

In terms of her own land, because it has a gentle slope, she will fence the cut edge with vetiver. She now tells farmers to contour with vetiver and lemon grass (which is used as an export).

Feedback from workshop:
"The workshop was good, the visuals were good, and the structure was good."

Ways that the workshop could be improved:

- Needed more public awareness of the workshop
- She would have liked to do more days at the workshop, but she could not herself.

Post-workshop how to get the word about vetiver out?

- In Grenada there is limited awareness of vetiver grass and what it can do. Ads and programs are needed to promote it. The Grenada Ministries of Agriculture and Forestry need to follow up and involve their public relations unit.
- Outreach to children through 4H programs is important (she mentioned being in charge of the 4H program).

She will be using vetiver and the VS on her future property that she is planning on buying. She does not foresee any challenges with using the grass and VS. She stated that it is, “almost as if its some secret” and said that farmers and contractors need to know about the grass.

Vetiver For Handicrafts, Essential Oils, Soaps, and Perfumes

The ESGI Vetiver Grass workshop in November 2020 included seven handicraft production workshops, one soap-making demonstration, and one essential oil production demonstration. The main problem faced was securing a competent handicraft instructor locally. The instructor available for the workshop, Anthony Glasgow, aka “King Coat,” had been working with and producing vetiver crafts for decades. He is a lovely character and a good teacher, but it was determined that he could only take the participants to a basic level. Fortunately, the participants were so enthusiastic and appreciative that about 8 of them were able to complete salable items during the 7 days’ training.

At that point all funds allocated to this aspect of the project were exhausted. ESGI personnel would like to engage again with “King Coat”, to make a short video that details the process of preparing and making crafts with vetiver. Importantly, training in the area of handicraft production has the potential to generate income for participants. Additionally, ESGI recently made a donation of vetiver grass leaves and provided instruction on its use through Mr. Glasgow. White Cane Industries is run by the Grenada National Council of the Disabled (GNCD) under the Ministry of Social Development and it is the only manufacturer producing crafts made by persons with disabilities. Additional training could be made available if the grass works well for them.

Figure 24 Vetiver Grass being cleaned & prepared by "King Coat" for handicrafts making.

Figure 25 A donation of prepared vetiver grass material was made to White Cane Industries.

While there is a lot of potential and interest in developing the vetiver handicrafts industry in Grenada, there are clear limitations in terms of sourcing highly skilled instructors. To take it to the next step would involve a new grant with enough funding to employ a skilled craftsperson to travel from St. Vincent or Venezuela or Trinidad to continue and expand the training.

In the final reporting period (Feb 2022), acting on lessons learned from project outcomes over the previous 22 months, the remaining funding was spent on 12 additional days of handicraft training to three new groups of participants (34 additional people) where the participants were gifted slips to plant at their homes and communities and also given donations of grass to continue doing handicraft. The handicraft trainings took place at White Cane (4 days), Grand Anse (4 days) and Après Tout (4 days).

Figure 26 Top Two Photos - Enthusiastic handicraft workshop group and their products at Après Tout (Feb 2022).

Figure 27 Photos (directly above) of Enthusiastic handicraft workshop group and their products at Grand Anse (Feb 2022).

Figure 28 Completion certificates awarded for Handicraft Workshop participants at Grand Anse workshop

Figure 29 Mr. Sean Henry demonstrating distilling of vetiver essential oils from dried roots.

In terms of producing essential oils from the vetiver grass roots, Mr. Sean Irwin Henry, Chief Chemist at Grenada Produce Chemist Laboratory, demonstrated distilling of vetiver essential oil from the dried roots at the Produce Chemist Laboratory in Tanteen. Quite a bit of vetiver roots are needed to produce a small amount of oil. The equipment to extract the essential oil is not widely accessible to most people in Grenada. Other concerns about the process of extracting essential oils from vetiver roots is that for this process the vetiver being used for its roots needs to be grown in bags where the roots can be easily obtained, as opposed to digging the vetiver out of the ground to obtain the roots, and thereby disturbing the soil and losing the plant's ability to be an agent for soil erosion control.

The soap making demonstration was completed by Ms. Paula Bell who was recommended to ESGI by Mr. Hudson Codrington who is in charge of the Grenville market where she sells her soaps. She provided one soap making demonstration for enthusiastic participants. In particular, one of the participants, Ing'utu Buckmire, has gone on to excel in the process of making soaps

using essential oils and she has been able to sell her soaps which she reports are popular (Fig. 27).

Figure 30 Paula Bell with the participants of the soap making workshop

Figure 31 Ing'utu Buckmire, vetiver handicraft and soap making workshop participant selling soaps and lotions that she produced using vetiver essential oils.

Extended and Future Impacts of the ESGI Project and Workshop

Although the ESGI workshop occurred in Nov 2020, the dissemination of knowledge about vetiver grass and the VS has continued through the Vetiver Grenada website and the signage at the demo sites, along with the other products produced as a result of the ESGI project.

<u>The Potential for Vetiver Grass and the VS at the Perseverance Landfill:</u>
ESGI was approached through their website, www.VetiverGrenada.com, by Mr. Allison Martin Neptune, Project Manager for Grenada Solid Waste Management Authority (GSWMA) and a representative from HYDEA (s.p.a.), design consultants for the project, to source a large quantity of vetiver grass plants to be used for the remediation of the old landfill. Mr. Michele Lambertini, design consultant and resident engineer with HYDEA (s.p.a.) has worked successfully with vetiver on a landfill in Fiji. Vetiver is a great alternative for phytoremediation because it is a fast-growing and non-invasive plant that will consume landfill leachate and wastewater to greatly reduce or eliminate the need for other disposal methods.

Figure 32 Photos of vetiver grass and the VS being used in a landfill remediation project in Fiji (Photos provided by M. Lambertini).

Figure 33 Perseverance Landfill, Grenada – future site of remediation, potentially incorporating the use of Vetiver grass and the VS.

Mr. Lambertini is responsible for the design of the old landfill remediation and very interested in using vetiver since it had been so effective and economical in the case of Fiji. In an interview Mr. Lambertini expressed that vetiver's ability to stabilize the slopes and prevent erosion, along with its phytoremediation properties make it the best solution in this situation. At the Perseverance dump, monitoring of river surface water next to the landfill indicates that leachate is running straight into the sea. It appears that this project will begin sometime in 2022 and it may involve installing a large quantity of vetiver slips on the landfill site. This project has the potential to add 8,333 linear feet of vetiver planting to Grenada and, more importantly, have a significant impact on reducing pollutants directly entering the ocean. If properly installed, vetiver could make a difference to the landfill and be used to highlight the Vetiver System (VS), the ESGI project, and the UNDP's GEF SGP in Grenada.

<u>Future Use of Vetiver for Watershed Restoration and Coastal Stabilization - The Nature Conservancy:</u>

ESGI has been approached by TNC (The Nature Conservancy) to collaborate with incorporating vetiver into their two projects to target farmers in Grenville watershed areas and shoreline stabilization for Soubise. This collaboration may prove useful since ESGI has not been fully successful in engaging members of the Soubise area community to become involved in the growing and maintenance of the vetiver planted along the coast.

<u>Potential in the Tourism Industry</u>

Per remarks made by Maxine Harris, Consultant Project Manager of the Sandals Foundation, at the launch of the IICA-CBF-EbA project, the potential for employment and linkages between vetiver and tourism is good. The Sandals hotel chain has a presence in Grenada and most of the

other Caribbean islands. Ms. Harris expressed an interest not only in handicrafts and other products made with vetiver being available for purchase by Sandals guests but also the potential of eco-tours where they could view the process of growing the plants, preparing the leaves, making the baskets, etc. This could be extended to taking visitors to view vetiver installations and introducing them to the VS.

Continued Dissemination of Knowledge of Vetiver Grass and the VS in Grenada

Figure 34 Grenada Rise visited with the ESGI Team to learn more about vetiver and the VS.

Since the workshop and installation of the demo sites, ESGI gets regular emails and messages on their website and Facebook accounts from individuals and groups interested in learning more about vetiver grass, the VS, and the GEF SGP funded project. For instance, recently a new group, calling themselves 'Grenada Rise' saw the Vetiver Grenada website and visited in Jan 2022 to learn more about vetiver and the VS. It is anticipated that this will continue and expand over time. While the funding period under the UNDP GEF SGP grant is ending, the ESGI Team have stated their willingness to continue working on bringing awareness and education about the value of the VS, and benefits and opportunities that vetiver grass can continue to provide for the people of Grenada.

Outcomes and Products Associated with the ESGI Project to Provide Ongoing Sources of Information

As promised in the proposal, throughout the timeline of the ESGI project there has been a conscious effort to create an ongoing source of information by way of documentation, videos, and an online presence to reinforce and make more widely available the knowledge presented during the workshop. The following are some of the outcomes and products associated with the ESGI Project:

- A Thin Green Line - In Grenada (A Thin Green Line - In Grenada (https://vimeo.com/589975013) – this video is a product from the Vetiver workshop and was produced by Film Producer, Lawrence Dupuis. This video is a useful tool to generate publicity for the UNDP's GEF SGP Program in Grenada, awareness of ESGI, and spread awareness of the availability of the VS to a wider audience.
- Vetiver Grass Training (Ministry of Agriculture, Lands and Forestry Grenada) (https://vetivergrenada.com/ministry-of-agriculture/). The PR unit of the Ministry of Agriculture, Lands and Forestry Grenada attended the training and installation of the

demonstration sites at the Crochu RC Primary School 4H garden, and the training of staff and installation of plants at Mirabeau propagation station. The video produced highlights the many benefits of vetiver and the potential of vetiver grass and the VS as an educational tool in primary and secondary schools in Grenada.

- The Vetiver Grenada website (https://vetivergrenada.com/) created and maintained by ESGI.
- Vetiver Workshop Brochure (https://vetivergrenada.com/vetiver-workshop-brochure/) – Describes Vetiver grass and the VS and details the benefits of vetiver for reducing soil erosion, conservating soil and water, and its potential for economic benefits through handicrafts and using the essential oils for soap and perfume making. Makes the public aware of the uses of vetiver grass, while promoting the GEF SGP funded workshop.
- Vetiver Handbook (https://vetivergrenada.com/vetiver-handbook/) is on the website Resources page. This flipsnack book was created by ESGI to provide instructions and essential information on propagation and planting using the VS. Several benefits of vetiver are presented including growing the grass for essential oils and handicraft production, and phytoremediation to deal with pollutants. It serves as a technical manual.
- Vetiver Handicraft brochure (https://vetivergrenada.com/vetiver-handicraft-brochure/) – available on the website Resources page. Describes the characteristics of vetiver grass and lays out the potential of vetiver grass for providing self-employment opportunities in the areas of handicraft making, essential oil production, and soap and perfume making.
- TVNI handicraft Webinar presentation (https://youtu.be/RTIfLsLA3_w) May 17th 2021 on Vetiver and Handicrafts. Representative June Slinger was invited to present at this webinar on the handicraft trainings that were a part of the Vetiver workshop.
- Signage promoting the UNDP GEF SGP funded Project and the VS at the demonstration sites.
- Demo tent at the Mirabeau plant distribution opening ceremony.

Figure 35 Signage to promote the UNDP GEF SGP vetiver project implemented by ESGI.

Figure 36 ESGI demo tent display hosted by ESGI Secretary June Slinger at Mirabeau plant distribution opening ceremony with Minister of Agriculture, Hon. Peter David in attendance

Assessment

Vetiver is something that is familiar to most Grenadians. Many workshop participants and other people interviewed for this M & E report stated that they had some experience or childhood remembrance of vetiver grass (frequently referred to as sweet root, razor grass or khus khus) being used to keep clothes fresh. As shown in these photographs taken during the M & E period, vetiver can be found growing in mostly in small clumps, and sometimes in short rows along the side of the road and in association with small residence in rural areas of Grenada.

Figure 37 Images showing vetiver grass growing nearby residences alongside the road to Gouyave.

However, experience of using vetiver for land management purposes (soil erosion control, soil and water conservation, landslide slippage, building terraces) is not common and the knowledge of how to properly plant vetiver for these purposes is not strong. The UNDP GEF SGP project implemented by ESGI has reintroduced vetiver to Grenada in a novel and potentially significant way.

With the goal of supplying the workshop trainings, demonstration site plantings, and giving extra to participants wanting to plant on their own residences or businesses, ESGI established a vetiver grass nursery (https://spark.adobe.com/video/GgWb0CiBpmavv). Through the initial period of the project, ESGI donated 6200 vetiver slips. These 6200 donated slips translate into an additional 2,266 linear feet of vetiver that has been planted throughout Grenada using the VS through the work of ESGI supported by the UN SGP sponsored project. Based on interest from exposure to the website and sources of training and information materials, 833 additional linear feet (2500 slips) of vetiver grass was planted using the VS after the workshop. In the final reporting period of the project, an additional 2,500 slips were donated in the following manner – 1,000 slips to Mirabeau nursery, 1,000 slips to a female farmer in Mardi Gras experiencing severe erosion on her farm, and 500 slips and other grass material provided to participants in three handicraft workshops in February 2023. With these additional donations, ESGI's UN SGP sponsored project provided the opportunity for 914 additional of 914 linear feet. All in all, based on the vetiver slips distributed, the project provided for 4,013 linear feet of vetiver to be planted in Grenada. Most importantly, a vetiver nursery has been established at Mirabeau

propagation station, an excellent sign for secure future distribution of vetiver plant material to farmers.

The Vetiver workshop took place from Nov. 16th - Nov. 27th, 2020. The workshop training and installation of the demonstration sites was facilitated by Mr. Jonathan Barcant of Vetiver TT Ecological Engineering Solutions Ltd. using a model established by the TT-based NGO IAMovement called the Vetiver Education & Empowerment Project (VEEP). Based on feedback supplied by participants through post workshop surveys and interviews, Mr. Barcant's workshop presentations, both virtual and otherwise, were very well received and the participants felt that they had learned a lot from the sessions. Data from pre- and post-workshop surveys (short-term and long-term in the case of the post-surveys) indicate that workshop participants were successful in obtaining knowledge about the vetiver plant and the VS. A comparison of the responses to knowledge questions before and shortly after the workshop event(s) show this increase in knowledge about vetiver grass and the VS and indicate an increased level of comfort with using vetiver and the VS, along with a shift in desire to use vetiver as a tool in the fight to stop soil erosion. Long-term survey data suggest that the participants retained a very high level of knowledge from the Vetiver workshop even 8 months after the workshop.

An important component of the vetiver training was the establishment of vetiver grass demonstration sites as part of the hands-on training for the workshop participants and as models to raise awareness by the public and promote knowledge of the VS. While two sites were initially written into the project proposal, the result was that six successful demonstration sites were created by Mr. Barcant and the ESGI team over a two-week period. Beyond the planned sites of St. Martin de Porres R.C. School (Crochu) 4H garden and the Marquis/Soubise recreation area in St. Andrew, the demonstrations included a pig farm in Gouyave, a residential housing site, a hotel in the Grand Anse area, and at the Mirabeau Propagation Station. Additionally, Jonathan provided several short introductory educational activities to several officers and prisoners at Her Majesty's Prisons in St Georges where another GEF SGP funded project is being implemented. This site was also supplied with donations of vetiver material from ESGI and follow up visits with ESGI team members to supply expertise on the VS.

This project was successful in meeting its goals of disseminating information about the VS to a wide cross section of communities and entities in Grenada. The participants of the workshop and others who were made aware of the VS via the Vetiver Grenada website and other social media made for the project were empowered with the knowledge of an easily available soft engineering green technology which several of them then used to mitigate land erosion and rehabilitate degraded land in their residences, businesses, farms, and communities. Thereby protecting and improving their assets and their surrounding environment for the benefit of all.

Through offering a total of 19 handicraft production workshops, ESGI's GEF SGP project provided opportunities for more than 50 people to be exposed to handicraft making with vetiver material (34 in 12 workshops in the final reporting period in February 2022). Several of these participants were able to make an end-product during the workshop they attended.

Participants of these workshops are already seeking additional vetiver grass material to continue making products. It is still too early to assess the impact of these workshops in terms of generating self-employment in the handicrafts industry.

The ESGI GEF SGP proposal outlined a very ambitious project with a rigorous schedule and comprehensive programme, and in many respects, implementation exceeded the proposed goals. They rose to meet stakeholder interest and demand by pushing to cover more activities than originally planned in regard to workshop activities, planned demonstration sites, and handicraft designated workshops. They were successful in securing a reliable source of vetiver plant material for all of the project activities, including providing many Grenadian farmers and homeowners with material to try to establish their own vetiver hedges. Another area of success for the ESGI project is the provision of ongoing sources of information that will ensure the sustainability of this project and highlight the success of the UNDP GEF SGP grants programme well into the future. The activities of the Perseverance Landfill and the Nature Conservancy indicate the extended and future impacts of the ESGI Vetiver project, and the yet untapped potential of vetiver grass and the VS in Grenada.

Sustainability of the UNDP GEF SGP ESGI Project – Recommendations Moving Forward

Sourcing Vetiver Slips

In terms of ensuring long term supply of vetiver grass material for farmers, homeowners, hoteliers, handicraft makers, interested communities, and future government infrastructure projects, it is essential that Mirabeau Plant Propagation Station uses the vetiver slip donations from the ESGI GEF SGP funded project to establish a well-stocked nursery. The distribution of vetiver slips could become a part of the yearly plant distribution process that is currently in place. Ocean Edge Farm in Crochu is continuously expanding their nurseries in order to ensure they can play a role in meeting an increase in demand for vetiver, thereby ensuring the sustainability of this project and long-term success of vetiver in Grenada.

Training

Based on feedback from workshop participants, there is a feeling that the expanded island-wide adoption of vetiver grass and the VS in Grenada could be enabled through continued opportunities for training including topics such as the preparation of vetiver slips for planting; how to establish a vetiver nursery; best maintenance techniques and schedule for vetiver hedges (considerable maintenance for the first 3 or 4 months and probably every 4 months after that to keep it in good shape). This could include a workshop for the “training of trainers” meant for extension workers, staff from the Propagation Station, and other farmers who are considered leaders in their communities. The Mirabeau Propagation Station would be best positioned to offer such training and extension services.

Expanding the Education Initiative Through Establishment at the Primary and Secondary Level

The potential for the St. Martin de Porres R.C. School demonstration site as a “living learning lab,” a place of high impact educational practices is strong. There should be serious consideration given to the replication of this project at other primary and secondary schools in

Grenada. These types of educational initiatives provided at an early age can open pathways for employment and/or advanced education opportunities for the Grenadian youth.

Development of Employment and Financial Opportunities

Vetiver grass has the potential to provide a number of self-employment opportunities through the handicrafts industry, essential oils and soap making, through tourism, and even through growing the plants to create slips for sale or the leaves for sale to homeowners and handicraft makers. During the vetiver workshop, Jonathan Barcant discussed the concept of marketing vetiver products, including soap, root bundles and essential oil, for export through a Caribbean wide 'House of Vetiver', led by the company already established in Trinidad. Something like this would be especially beneficial when the local and tourism markets are down, such as experienced during the Covid-19 pandemic. Care should be taken to educate any participants interested in extracting essential oils from the vetiver roots about the potential to exacerbate soil erosion if the plants are removed from the ground to obtain the roots.

Consideration of future projects to address the significant soil erosion challenges experienced in Carriacou

Dario and Marina Sandrini of the KIDO Foundation in Carriacou shared communication from their neighbors in the High North of Carriacou who are, "very interested in using the vetiver grass that you demonstrated at high north after watching the video on the vetiver Grenada website." The potential benefits of vetiver and the VS in this hilly and steep part of the island where soil erosion is severe are tremendous. The development of a sustained source of vetiver slips at a local site in Carriacou should be considered as a worthwhile investment.

List of Demonstration Sites and Additional Vetiver Planting Sites Visited During M & E Period in July 2021

Demonstration sites visited:
Soubise Community
St. Martin de Porres R.C. School in Crochu
Mirabeau Research Extension Station
Keemo Vincent's pig Farm
Yasmin Ali residence in Calivigny
Sea Breeze Hotel in Grand Anse

Additional vetiver planting site visited:
Kido Foundation in Carriacou
Richmond Hill prison – Her Majesty's Prison (Collaboration site)

List of related meetings completed during the M & E Period in July 2021

Alison Haynes – Agronomist and Manager of Mirabeau Research Extension Station
Brian Hazzard - St. Martin de Porres R.C. School 4H program coordinator
Justin Lewis – representative from Sea Breeze Hotel
Keemo Vincent – Pig farmer
Christopher Stroude - Richmond Hill prison – Her Majesty's Prison
Dario and Marina Sandrini - Kido Foundation in Carriacou
Wayne Palmer - Residential owner
Yasmin (surname) - Residential owner
Mr. Michele Lambertini – Engineer, Perseverance landfill remediation project
Albert Buckmire – ESGI representative
Ing'utu Buckmire – ESGI representative
June Slinger- EGSI representative
Sahai Gibbs – Ministry of Infrastructure and Development at the time of the workshop, now in Ministry of Physical Planning
Rena Noel – Senior agricultural Officer
Trevor Thompson - Senior land use officer, Ministry of Agriculture

Appreciation

I would like to express sincere appreciation to all the people, including workshop participants, those associated with demonstration sites, Ministry officials, government officials, and the ESGI team members who spoke with me during the period of monitoring and assessment while on the ground in Grenada. I could not have produced this report without their time and willingness to provide feedback on this UNDP GEF SGP funded project. Thank you!

END