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Changing Agricultural Practices to Reduce Erosion and Runoff

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Outline

- Project summary
- Brief overview of farming in USVI
- Brief overview of vetiver grass and vetiver system
- Overview presentation
- Overview workshop
- Results
 - Attendees presentation- characteristics
 - Attendees WS – characteristics
 - Evaluation results
 - Followup results
 - Interpretation
- Recommendations

Project Summary

- This is a two-year educational project supported by Southern SARE to increase the sustainability of agriculture in the USVI. It consists of
 - Presentations for 100 farmers and interested staff to provide information about the use of Vetiver grass for erosion control and water management
 - A hands-on workshop for a smaller cohort of participants to learn and practice vetiver maintenance, propagation, and planting. Vetiver slips would be given to the participants. (20-40 slips) 6 farms total.
 - Development of a Vetiver Nursery on both St Thomas and St Croix (Guayacan Farm) for access to planting material, demonstration sites, and teaching.
 - Evaluation – Phone call to review the planting and any problems. Farm visit to see if the plantings have been successful.
- The teaching is through presentation, demonstration sites, mentoring by the two farmer collaborators, and hands-on experiences

Farming in the USVI

- St Thomas and St John have very hilly terrain with stoney soil and St Croix has a caliche soil.
- The soil in the territory is classified as highly erodible.
- Water is frequently insufficient with periods of over abundant water.
- There are about 550 licensed farms – 10,000 acres.
- 83% are small holder farms of less than 10 acres.
- 95% of food is imported

Farming in the USVI

- Average age of farmers is about 62 yrs
- The average income is not sustainable so many are employed off their farms.
- Frequently there are inadequate resources for soil conservation, farm improvements, and ways to increase productivity

Vetiver

- Vetiver grass is used in more than 100 countries worldwide including the Caribbean for erosion control, water management, and improved soil health
- Introduced in USVI
- Sugar plantations
- Early questions indicated that this was due to:
 - Having concerns that it could be invasive,
 - Not having access to planting material,
 - Lack of knowledge about the maintenance of the grass and
 - The inability to see the grass in use.
- Vetiver grass would be an excellent low cost, sustainable, and ecological resource for the USVI

Vetiver Grass

- *Chrysopogon zizanioides* (L.) Roberty, is a fast-growing noninvasive tropical perennial bunch grass from Southern India.
- Develops an extensive dense and deep root system. In the first two years this root system can extend 6-9 feet deep creating an underground wall that stabilizes the soil.(3)
- The roots have a tensile strength of 1/6 that of mild steel, and when planted in hedges they will increase soil shear strength by up to 45%.
- It has associated nitrogen processing mycorrhiza.



Farmers

Having farmers adopt new techniques or products involves complex factors including:

- economic considerations,
- social support, and
- access to information.

Barriers include:

- lack of financial resources,
- inadequate external resources, and
- lack of knowledge

Farmers are more likely to adopt new practices if they perceive benefits like:

- increased yields,
- reduced costs,
- improved environmental outcomes, and if
- they have a sense of “Self-efficacy” or a belief in their own ability to perform a demanding or challenging task

Behavior Change Theory

The structure of the project was based on the following Behavior Change theories

- **Theory of Planned Behavior (TPB):** behavior is influenced by an individual's intention which is affected by their attitude toward the behavior, their perception of social expectations, and their perceived behavioral control.
- **COM-B Model:** This model states that to engage in a behavior, a person must have the capability, opportunity, and motivation to do so.

Project Design

- Basic information about vetiver was provided in the presentation.
- The participants identified the problems that they were facing on their property.
- The presentation showed the solutions with many local examples of the use.
- A hands-on workshop on how to use and maintain the grass was offered.
- Farmer collaborators were on both St Croix and St Thomas to promote the use, provide demonstration sites, and assist with information and problems

Presentation

- The characteristics of Vetiver
- The Vetiver system and how the grass is used in:
 - Agriculture
 - Erosion control
 - Water conservation
 - Mulch
 - Forage
 - Pest control
 - Soil fertility
 - Engineering
 - Slope stabilization
 - Roads
 - Dams and ponds
 - Drains, Guts, and Gullies
 - Disaster Mitigation
 - Landslide Prevention
 - Watershed Protection

Uses on a Farm

- Boundaries



Vetiver Network International

- Erosion control



- Crop management



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- Remediation



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Erosion Control and Bioterracing

- Planted as a hedge along a contour line it forms a filter barrier that:
 - Slows down the flow of rainfall runoff to reduce the erosive velocity of water, and
 - It traps sediment carried by the runoff on the upslope side of the hedge.
- These sediment depositions decrease the slope gradient and this:
 - Further slows the velocity of run off
 - Vetiver continues to grow and maintains effectiveness as these natural terrace risers gain height.
- Able to reduce soil erosion by up to 90%



Water conservation

- Vetiver hedgerows will:
 - Reduce water runoff by as much as 70% particularly in extreme rainfall events
 - Improve water infiltration, and
 - increase soil moisture
- The runoff is slowed and spread over a larger area.
- Experimental works in India with vetiver grass showed significant increase of soil moisture and crop yields (10)



[Vetiver Network International](#)

Roads



Picture by Cristina Chanes Nov 2024 Recent rains on St Thomas



Roads

Slope stabilization

Roads

Dams and ponds

Drains, Guts, and Gullies



Workshop

- All participants indicated that they
 - Intended to use the grass, and
 - Had a site ready for its use.
- Covered
 - Where to plant – contours, guts, and for water diversion.
 - How to maintain a hedgerow.
 - How to obtain slips for planting.
 - How to propagate the grass.

Established Hedgerows

- They practiced maintenance on an established hedgerow



Vetiver Grass Nursery

- In the nursery – dug up the plants, cleaned and trimmed them, separated into the slips that they received, and learned initial care.



Results- 1st Year -Presentation

- 73 individuals (77 attendees)
- 36 Farmers
- 19 gardeners
- 13 Agricultural Professionals – DPNR, UVI
- 75% Farmers/Gardeners
- 65 evaluations completed – 90%
- STJ – 8 -3 gardeners 38%
- STT – 28 – 22 Farmers/Gardeners 79%
- STX – 37 – 30 Farmers/Gardeners 81%

Results- Presentation

Statement of Issues

Island	#	erosion	Water runoff	Water conservation	Roads	Terrain
STJ	5	4 -80%			4 -80%	4 -80%
STT	18	17-94%	12-67%	8-44%	11-61%	11-61%
STX	15	13-87%	13-87%	7-47%	10-67%	10-67%

Results - Workshop

- 17 Participants – 540 slips given along with 70 plants and one hedgerow of 30 feet

Island		Farmer/gardener	Homeowner
STJ	1	1	
STT	11	8 – 73 %	3
STX	5	4 – 80%	

- All participants had indicated their intention to use the slips and that they had a place to plant it. Following the presentation 4 changed where they planned to plant it .

Results - Workshop

	#	erosion	Water runoff	Water conservation	Roads	Terrain
STJ	1	1				
STT	11	11 - 100%	7 - 64%	7 - 64%	7 - 64%	6 - 56%
STX	5	5 - 100%	5 - 100%	3 - 60%	3 - 60%	3 - 60%
Total	16	16	12 - 75%	10 - 63%	10 - 63%	9 - 56%

1st Follow-up

Question	Range					
1 How many slips did you receive?						
2 After the workshop how confident were you about planting the slips	1 to 5	not at all	a little	neutral	a few questions	completely
3 After the workshop how confident were you about propagating the 3 slips	1 to 5	not at all	a little	neutral	a few questions	completely
4 Did you have a place prepared to plant?	yes/no					
5 How did you care for them initially?	in water	potted				
6 how many of your vetiver slips survived?	1 to 5	<25%	25-50%	50-75%	75-90%	90-100%
7 When did you plant them?	1 to 5	<1 month	1 month	2 weeks	one week	immediately
8 Did you pot any to propagate?	yes/no					
9 How many did you pot to propagate						
10 Have you divided any of the vetiver?	yes/no					
11 what barriers did you have to planting them						
12 what benefits or problems have you seen						

1st Follow-up

- Q2-Confidence about planting (1-5) -4.8
- Q3- Q2-Confidence about propagation (1-5)
4.6
- Q6 – generally had 80-90% survival except for 4 people -had in pots and the slips received inadequate water.
- Q7 – generally more than one month
- Q8 – ½ potted all to propagate

1st Follow-up

- **Barriers**

- Needed many more plants for the site so started by potting in order to propagate
- After the WS the original site would not be correct so had to change. (one landlord began construction)
- When planting didn't want to use so many in one site so spread them out.



Follow-up

- **Early follow-up showed hesitancy about exactly where to plant. Consults were added**
 - 6 consults – 5 in person, one telephone and pictures.
 - 4 planted the grass and within 2 months saw a decrease in erosion and stabilization of walkways.
 - 1 planted the grass but not as a hedgerow – advice given by phone
 - 1 still wants in pots to propagate – advice given about care.

Follow-up

- Planned behavior and a sense of “self efficacy” are only part of what will increase adoption of new techniques
- More social support and external resources are needed to increase the rate of planting

Future Course

- Bring a picture to the workshop for a consult about their plans during the workshop.
- Emphasize in ground planting.
- Early in person consult for planting outcome.
- Offer decreased price for slips from the nursery for larger projects.
- Connect the farmers with NRCS and EQUIP for conservation practices with the potential for reimbursement.

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