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
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  - 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 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 sheer 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

Vetiver Network International

- Remediation

Vetiver Network International

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 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) -4.4
- Q3- Q2-Confidence about ppropagation (1-5) 4.2
- 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**
  - 5 consults – 4 in person, one telephone and pictures.
  - 3 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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