Vetiver Grass for the Virgin Islands

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Vetiver Grass

Vetiver Grass

- *Chrysopogon zizanioides* (L.) Roberty (1)
- Family: Poaceae
- Cultivar: Sunshine
- Common Local Names
- Jamaica: khus khus
- Puerto Rico: pachuli
- Haiti: herbe vetivert
- India: khas khas

Vetiver Grass

- Native to India, is a fast-growing noninvasive tropical perennial bunch grass
- It is related to Sorghum and has some similarities to other aromatic grasses such as lemongrass (*Cymbopopogon citratus*) and citronella (*Cynbopogon nardus*). **(2)**
- There are four types of *Chrysopogon zizanioides* the domesticated type which originated in southern India and is sterile and the wild type from northern India that is fertile. (1)
- The wild type which is found in Africa, China, and Australia can become an invasive weed. In particular the wild type in Africa grows along riverbanks and is easily confused with the sterile variety.
- *Chrysopogon zizanioides* (L.) Roberty is sterile and one cultivar Sunshine that was initially cultivated in Sunshine, Louisiana is now the primary cultivar found worldwide. **(2)** All of the sterile cultivars have been studied and have been found to be genetically the same. (2) The USDA has listed the *Chrysopogon zizanioides* (L.) Roberty Sunshine cultivar as being noninvasive.

Vetiver Grass

- Develops an extensive dense and deep root system.
- This root system does not produce lateral roots therefore the bunches do not spread laterally.
- It has associated nitrogen processing mycorrhiza, that explains its green growth throughout the year
- In the first two years following planting this root system can extend up to 3 m deep creating a dense 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%.
- When the grass is planted very closely it produces a dense hedge up to 7 feet tall

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Pests

- Very few pests
- Termites and ants in the roots
- Stem borer but only mild reduction of the crop
- Appears to be repellant to other pests
- Possibly may be a trap crop for *Chilo partellus – maize stem borer*

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Vetiver system

- Promoted by Vetiver Network International
- Used in 100 countries
- 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
  - Land Rehabilitation – phytoremediation
  - Water Rehabilitation
  - Watershed Protection
  - Coastal Protection
- Other
  - Oil
  - Roofing
  - Crafts

Erosion Control and Bioterracing

- Planted as a hedge along a contour line, forms a filter barrier this
  - slows down the flow of rainfall runoff water so that the erosive velocity of water is halted, and
  - traps sediment carried by the runoff on the upslope side of the hedge.
- The sediment depositions increase and the slope gradient becomes less,
  - further slowing 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%
- Reported soil loss reductions of over 100tons/ha have been reported (CIAT, Colombia)
- Also acts as a windbreak,
- Picture of erosion control in Zimbabwe

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Erosion Control and Bioterracing

- Filled behind hedgerow 8 inches

Erosion Control and Bioterracing

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 enhancement
- Vetiver hedgerows generally planted on the contour and every 6 feet of vertical distance.
- 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)

Water Conservation

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Mulch, Forage

- Vetiver grass when used as a mulch further reduces soil loss from erosion and increases soil moisture. The mulch reduces soil temperature by as much as 15^{o}C under extreme heat conditions; mulch degradation improves soil organic matter, enhancing soil micro flora and fauna activity, recycles soil nutrients, and reduces weed growth.
- Vetiver Hay is easily sun dried in a few hours, and produces up to 32 dry-tons per acre
- As it decomposes adds SOC

Pest control,

- Nonhost for nematodes – roots repellant to southern root knot, Meloidogyne incognita
- Dead-end trap plant for stem borer, Chilo suppressalis
- Vetiver grass is a habitat for beneficial parasitoid wasps

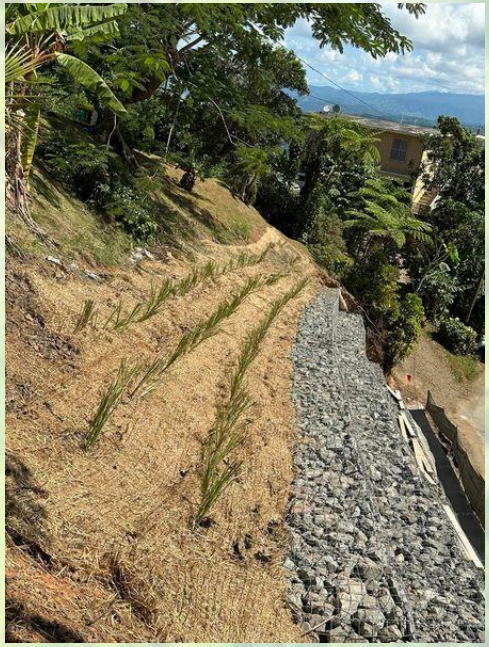
Vetiver in the Virgin Islands

- Engineering
- Slope stabilization
  - Roads
  - Dams and ponds
  - Drains, Guts, and Gullies

Slope stabilization

– Drains, Guts, and Gullies

2,100 plants in total. Vetiver system Puerto Rico.
Samuel Hernandez



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Roads

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Hillside Stabilization

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Vetiver in the Virgin Islands
Disaster Mitigation

- Landslide Prevention
- Land Rehabilitation
- Watershed Protection
- Coastal Protection

Land and Water Rehabilitation

- **Phytoremediation** basically refers to the use of plants and associated soil microbes to reduce the concentrations or toxic effects of contaminants in the environment.
- Vetiver's roots absorb heavy metals from soil and water, and the plant produces chelators and organic acids to bind with the toxic metal ions. The metal and chelator complex is then sequestered by the plant's cells, inactivating the metal ions. **Phytodegradation**
- 3 year study on reducing nitrogen and phosphorous runoff on sloping cropland in China with Vetiver Grass Hedgerows(VGH)(14)
- 5 fertilization treatments studied
  - VGH plus organic fertilizer
  - VGH plus inorganic fertilizer
  - either organic or inorganic fertilizer without VGH, and
  - no VGH or fertilizer (Control).
- Runoff pollutants were significantly reduced with the VGH 98% inorganic and 94% organic fertilizers
- Crop yields were increased

Land and Water Rehabilitation

- May also be used to treat water:
- Agricultural chemicals – N, P, Pesticides
- Effluent – fish, animals, human – reduces coliforms
- Industrial heavy metals

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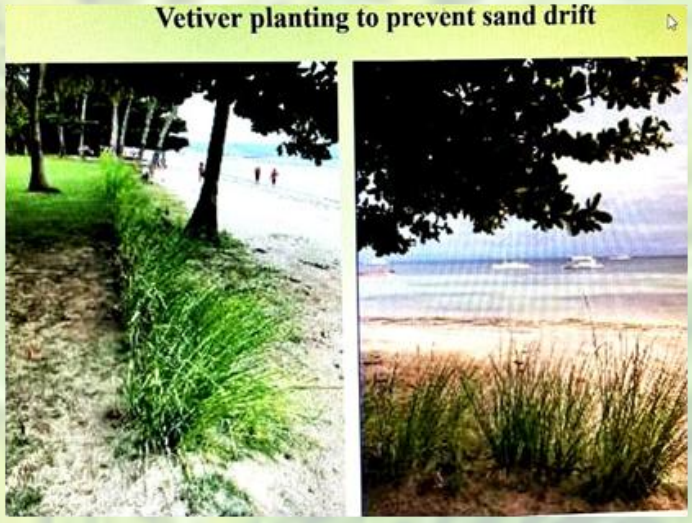
Coastal Protection

- Prevents drifting of sand
- Prevents erosion of the beach
- Protects the coast, mangroves, and reefs from pollution



Other

- Vetiver oil is antimicrobial particularly against Staphylococcus and antifungal
- Kenya uses an infusion water - it is used for bathing to prevent and treat skin infections
- Several countries make shoes using the roots for the soles to help prevent infection

Weaving

Other

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Other

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Growing

- Very adaptable
- Prefers sunny, hot, and humid tropical climate
- Tolerates:
  - Acid, alkaline, or saline soils,
  - Drought or flooding,(4) and
  - High levels of heavy metals such as lead, aluminum, cadmium, arsenic, zinc, and manganese. (1)
- It is also able to survive freezing and fire. (4)

Propagating

- Dig up a part of or an entire bunch
- Clean the roots of dirt and rocks
- Trim roots to several inches
- Trim the tops to 12 inches
- Separate into tillers
- Soak in water

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Vetiver Grass - Planting

- Prepare slips – cut to 6-12 inches roots should show new growth
- Plant in furrows or holes along the contour
- Water the area before planting may use a water-retaining polymer
- Apply manure (200 lbs) or fertilizer (20lbs) per 300 feet
- Plant 4-6 inches apart
- Water and weed initially (3)

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Management

- Older plants will tolerate weeds except vines that may cover it.
- When the plant is 2-3 feet high prune it to 10 to 12 inches.
- Use the prunings for mulch.
- To propagate:
  - Take slips from the lower edge of the bunch
  - Soak for 24 hrs
  - Plant or pot
- Cut back yearly – remove dried shoots

Maintenance

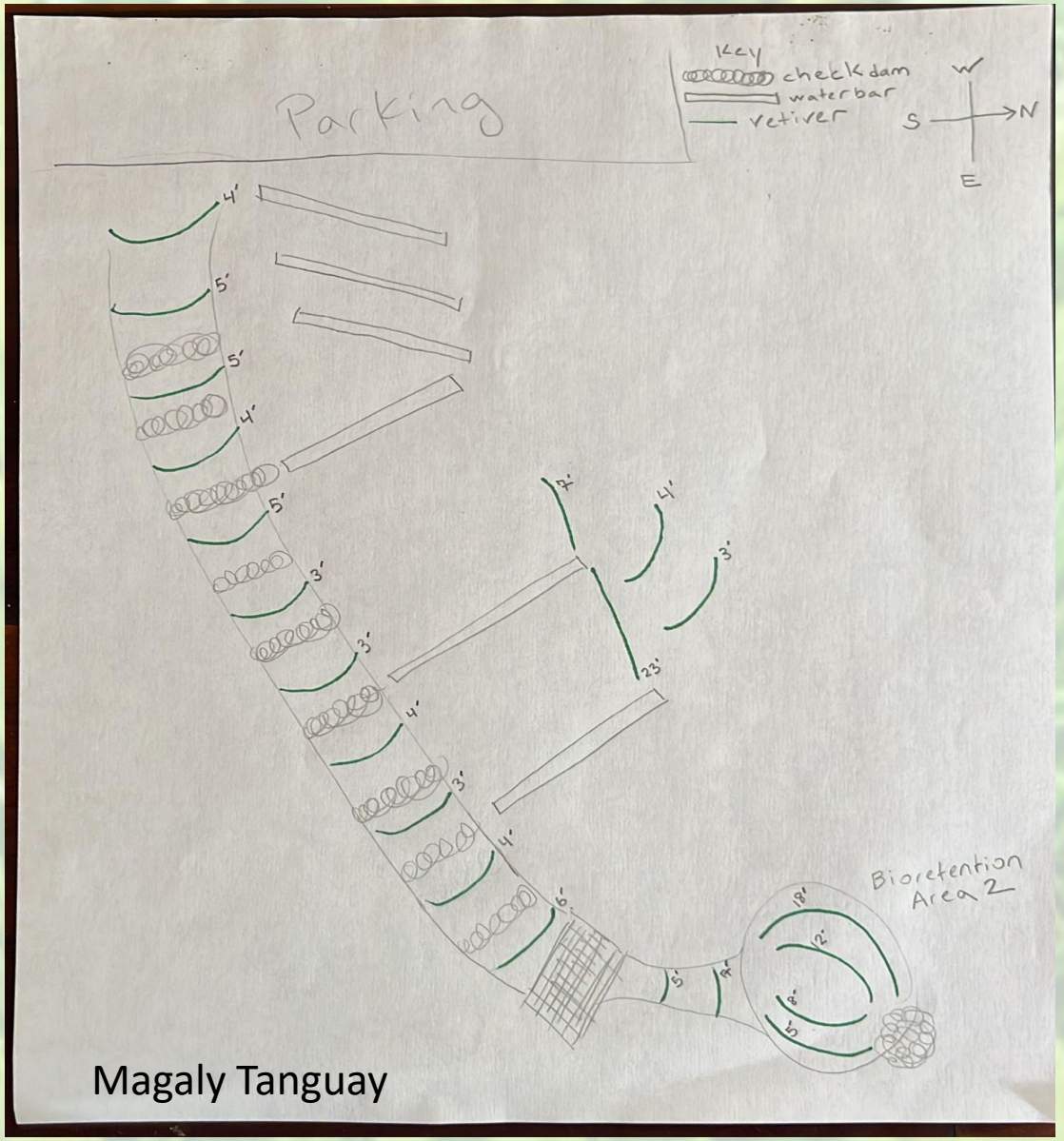
Tools used

- Planting
  - Pick
  - Small planter
  - Hori Knife
  - Clippers
- Maintenance
  - Sickle
  - Hedge Trimmer
  - Machete
  - Clippers

Whale Point

Magaly Tanguay

Whale Point



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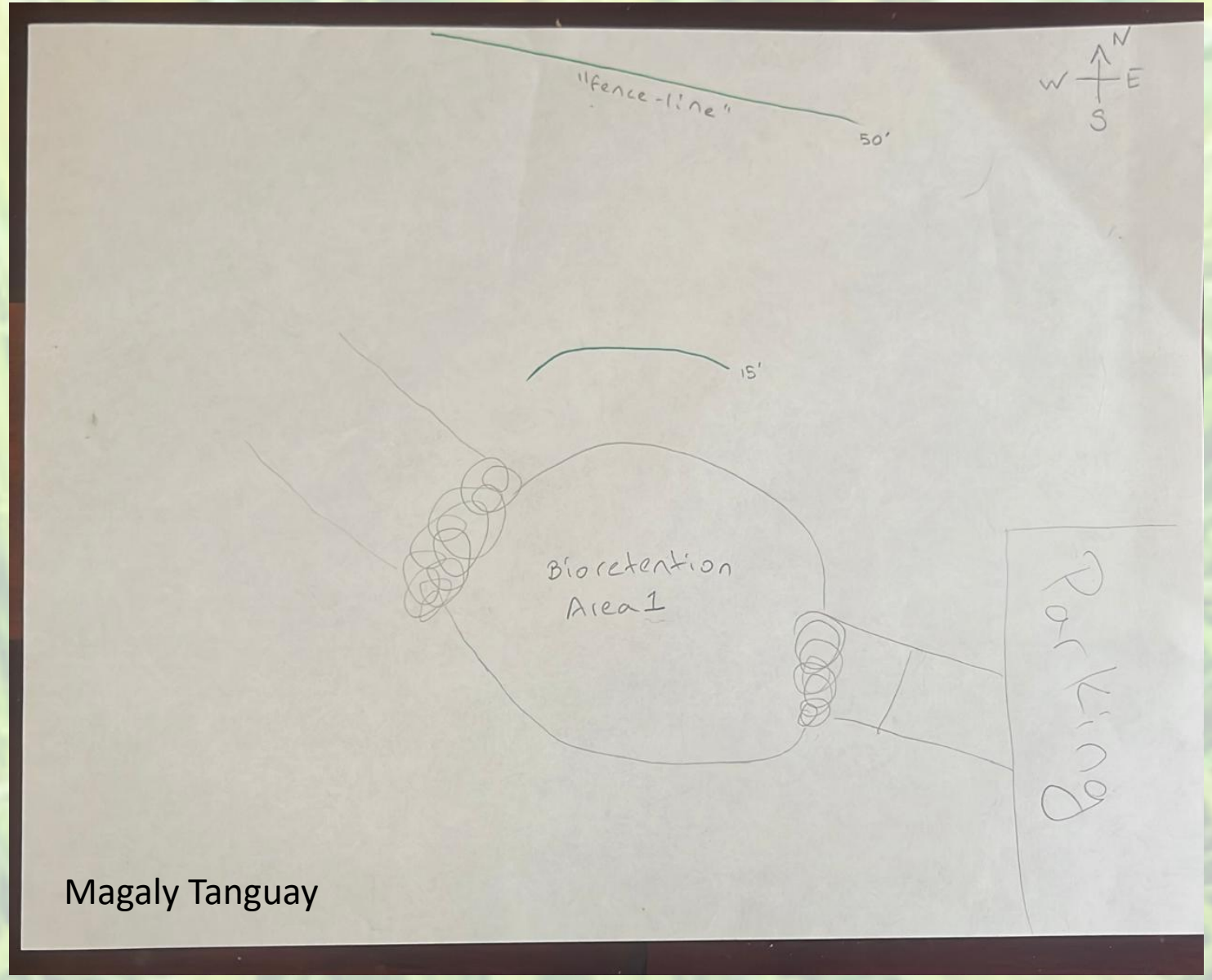
Whale Point



Magaly Tanguay

Vetiver Resources

ETHIOPIA WATER CONSERVATION

- https://www.youtube.com/watch?v=At7XQSw6ixY

- **EL VETIVER. SU MANEJO Y FUNCIONAMIENTO EN LA AGRICULTURA | Jairo Restrepo Rivera** https://www.youtube.com/watch?v=TghgiekDo00&t=978s

GROUP

- Facebook – International Vetiver Group

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