

Disaster Mitigation, Flood and Erosion Control in Haiti

Sometime back, I read the following in a Haiti Mission weekly report: "Reforestation is critical to reduce the occurrence of floods similar to the one that recently caused hundreds of deaths in the Mapou and Fonds-Verrettes in southeast Haiti." More recent, Tropical Storm Jeanne passed near the northern coast of Haiti, resulting in heavy rain, mudslides, and severe flooding, in the coastal areas of Gonaïves in the Artibonite resulting in several hundred deaths.

In the same report, I saw where the mission reacted expeditiously to support a request made by the Ministry of Agriculture for a nationwide tree seedling distribution activity. This entailed the rapid distribution of 140,000 seedlings in May and June 2004 to be planted in the 10 agricultural regions of the country, especially on highly eroded hillside areas.

Contrary to popular belief, trees are not very effective in preventing erosion in their formative years. If trees are to be effective in controlling erosion, they must be planted densely enough to form an adequate canopy to soften rainfall. Additionally, groundcover is an important part of the equation -- agricultural crops, grass or underbrush that contribute to creating a good amount of litter and duff that further protects the soil and increases water infiltration to recharge groundwater aquifers. This takes several years, as it does for trees to establish root systems extensive enough to anchor the soil to prevent slides and control erosion.

Hurricanes and the resulting floods are an ever occurring event. Once the soil is washed from the watersheds, such as those in southeastern areas of Haiti, the soil is lost forever. Thus the resources needed for Haitians in these areas to grow enough food to feed their families are greatly diminished; thus they become poorer and poorer. **When the next disaster occurs, a greater amount of outside relief aid will be needed. Therefore, it seems logical that USAID should invest in stabilizing these watersheds beyond planting just a few trees.**

The benefits and costs of disaster mitigation were dramatically demonstrated by in a project funded by USAID's OFDA in Kinshasa, DRC.* By adopting conservative assumptions -- and only accounting for direct economic losses -- one dollar of OFDA "investment" in disaster reduction in 1998 resulted in a "savings" of at least \$45.58 during the 1999 rainy season. More importantly, 100,000 project beneficiaries did not have to again incur direct economic losses amounting to \$7.1 million, or \$71.06 each, in 1999 because of the OFDA "investment" of \$1.56 per beneficiary in 1998. On a per-family basis, OFDA-supported disaster reduction measures resulted in a "savings" of \$426, or the equivalent of nearly 54 percent of average annual income, thereby enabling families to purchase the food, clothing, medicine, and other essential items that they may have had to forego in the event of a flood reoccurrence. **These benefits have continued to accrue over time because there has not been a repeat of the flooding that occurred in 1998.** There was also another beneficiary: OFDA. The 1998 investment in

* Charles Setchell. *Flood Mitigation in Kinshasa, DRC: A Success Story.* USAID/OFDA. May '02

disaster reduction eliminated the need for OFDA to provide flood-related disaster response funding in 1999, thereby saving time, effort, and money that can be applied to natural and complex disasters elsewhere.

USAID Mission support for the Ministry of Agriculture is laudable; however in reality, 140,000 seedlings (trees) will do little to control erosion on steep hillsides and aid in future disaster mitigation in Haiti. At an extremely wide spacing of 3 meters by 3 meters, this number of trees would only cover 126 hectares total or 12.6 hectares per region and would do little to control erosion.

On the other hand, vetiver grass planted on the contour of steep hillsides establishes extensive root systems and begins reducing erosion within the first year. A study by scientists from Texas A&M after Hurricane Mitch in Honduras, shows that **erosion was reduced from "92 tons of soil/ha/yr to 0.9 tons/ha/yr on steep hillside farms that were protected by contour hedgerows of vetiver."**¹

Vetiver hedgerows are not invasive, and are propagated by cuttings only. The plants do not produce viable seed. Planting hedgerows is labor intensive, but once established, they require little maintenance. Natural terraces begin forming behind vetiver hedgerows soon after planting. Not only do hedgerows mitigate erosion, but empirical data indicate that the survival, growth and production of trees and annual crops planted behind the hedges can be increased by as much as 50% by conserving topsoil, increasing the availability of nutrients and moisture for these plants. Ground water is also recharged. For example in China, **"Tea yields increased by 40% when grown in conjunction with vetiver grass hedges, and vetiver hedges are much cheaper and more effective than terraces."**² Vetiver hedgerows would also benefit coffee production in Haiti.

Vetiver planting materials are readily available in many areas in Haiti. Cuttings (slips) can be harvested from existing vetiver plantings without damage to existing systems. Harvesting techniques are easily taught, and the cuttings can be paid for by either cash or food-for-work (e.g., rice, beans, cooking oil). The cuttings can easily be bagged or boxed and transported to the planting sites, with care taken so the cuttings do not dry out. Similarly, farmers at the project site can also be paid to plant the hedgerows in either cash or food-for-work. A-frame levels can easily be constructed and used to ensure that hedgerows are planted on the contour. There are a number of cooperators in the Caribbean working with the Vetiver Network (see <http://www.vetiver.org>).

¹Toness, A.S., T.L. Thurow and H.El. Sierra. April 1998. *Sustainable Management of Tropical Steeplands: An Assessment of Terraces as a Soil and Water Conservation Technology*. Technical Bulletin No. 98-1. Soil Management Collaborative Research Support Program/Texas A&M University. 52p.; and Thurow, T.L. and J.E. Smith, Jr. April 1998. *Assessment of Soil and Water Conservation Methods Applied to the Cultivated Steeplands of Southern Honduras*. April 1998. Technical Bulletin No. 98-2. Soil Management Collaborative Research Support Program/Texas A&M University. 21p

²Ding Guan Min. Soil and Water Conservation Bureau, Fujian Province, China. in *The Vetiver Network Newsletter*, No. 18. December 1997. Home page: <http://www.vetiver.com>

Conservation Corps – Haitians have a cultural heritage of *combite* -- working together to help each other -- that can provide the basis for creating **Community Conservation Corps (CCC) to plant vetiver hedgerows**. Once organized, the CCCs, with technical assistance, can map out the extent of the land area that is associated with the community that is to be treated. Both public and private lands must be treated. This will require legal instruments to be enacted for the targeted watersheds that would allow communities to gain tenure of the public lands to be treated for effective erosion and flood control.

A watershed may comprise several catchment areas. To be effective in watershed stabilization, each catchment area must be treated, one at a time, with contour vetiver hedgerows in order to optimize engineering and environmental soundness. A potential problem is convincing farmers in the catchments/watersheds that a certain amount of land, some of which may be theirs, must be given up on which to plant the hedgerows for the greater good of the entire population.

Land tenure is a very complicated and a very emotionally-charged issue in Haiti. Traditionally, inherited tenure of a parcel of land is subdivided among siblings. As a result, ownership is fragmented, and most often, parcels of land are very small. In one catchment area, a person may be farming several very small parcels of land scattered throughout a catchment area. One or more of the parcels may be owned, and the others farmed on shares with one or more relative. Some may be tenant-farmed with rent paid to an absentee landowner, some of whom no longer reside in Haiti. Also there are a small number of squatters farming either public or private land without formal permission, and paying no rent. Other land in the catchment area may be public land or privately owned but not being farmed. Additionally, some people lay claim to large parcels of public land for which they have no deed, having gained access through a political concession, some paying a modest rent, by a former regime in Haiti, and sublease it out to tenant-farmers at a much higher rate.

Grass-roots democracy building -- There is a cultural tradition of Haitian farmers/owners within a catchment area or watershed joining to work together to address a common cause--termed "*combite*" (cooperative work party). This can serve as a basis to build and strengthen grass-roots democracy within the community by discussing the need for erosion and flood control and mitigation. Particular catchment areas can be delineated by using GPS, and through democratic dialogue, a community can map out individual land use patterns within the area. Tenure can be identified, which is necessary to determine and resolve issues of the placement contour hedgerows, and what kind of trees and other plants will be planted where, in order to optimize environmental soundness and economic benefits.

It is imperative that private land owners be allowed to retain ownership of their land and reap benefits from the improvements. However, in a given catchment/watershed, all land owners must participate in order for water/watershed management to be effective. If it is necessary to deprive *abitans* (small farmers) of a significant portion of their cropping land in the construction of erosion control barriers, etc., the *abitans* should be compensated with an equal portion of public land deeded to them.

Tree species selection and tenure -- Fruit, fodder and trees that can serve as a source of food (e.g., *Benzolive* – Moringa) are usually selected by farmers for planting in their fields. Trees for fuel, poles or higher-value construction wood are more appropriate for planting on public or common lands. There are two NGOs with tree seedling nurseries that are based in the Dominican Republic who assist farmers in SE Haiti where the recent floods occurred: FUDECO, an affiliate of the Save the Children, and World Vision.

Tenure is key to tree planting in Haiti, especially when it comes to public and common lands. Tenure determines who is responsible for planting and care of the trees, and who will reap the benefit or profit from growing the trees. Again, this is where the democratic process comes in. In order for this to work, the central government in Port-au-Prince community must provide legal certification to the community that the public/commons land within the catchment/watersheds is ceded to the community. Once this is done, the community can democratically decide how the land will be allocated; the first priority goes to compensate those farmers who lost land due to the planting of the vetiver hedgerows. The rest of the land can be parceled out and the community can issue performance-bond leases (a form of tenure) to individuals granting them tenure to the land for a specified period of land (e.g., 20-40 years) as long as they maintain it in an environmentally sound system (e.g., a specified amount of tree cover).

Vetiver as livestock forage – By periodic pruning the hedgerows, vetiver can provide voluminous amounts of mulch for composting to improve soil texture and carbon content in the natural terraces formed behind the hedgerows. Old-growth from vetiver hedgerows is best used for compost; however, young regrowth is tender and makes good livestock feed.

When the hedgerows are cut back, this will not reduce the effectiveness of the hedgerows to control flooding and erosion, for it does not damage their root systems. If the vetiver grass is combined with forage from leguminous shrubs/trees, such as *Leucaena*, the hedgerows would form an excellent basis for a cut-and-carry livestock system for tethered animals. Such systems could be coupled with the importation and distribution of the South African (Boer) meat goats (said to be most efficient in converting forage to energy for meat production) from the U.S. through Heifer Project International [www.heifer.org]. Supplementary *Leucaena* forage can be pruned from shade trees or yard fences planted around farmers' houses.

Distribution of these improved goats would provide a tremendous incentive for the establishment of the hedgerows, as well as creating a significant source of income for the farmers. This might also serve as a form of compensation to farmers for land lost in establishing contour hedgerows. Farmers would be required to tether all livestock in project areas. Tethering goats would reduce damage to trees and food crops caused by the small native free-roaming Haitian goats, and Haitian goats would be phased out of the project area with the introduction of Boer goats.

The Boer goats could either be distributed through a livestock loan program, or a system could be created whereby a farmer would be loaned a pregnant doe for care for. Goats most often give birth to twins, and the farmer would be given one of the twins as their own, and the second twin would be given to a second farmer, and the doe would be returned to the NGO for breeding and to loan out again to another *abitans*, thus multiplying results and creating cultural cohesiveness among farmers in the catchment.

There is a ready market for goat meat in the Caribbean and if a large enough supply was created, the goats could be marketed to the Haitian and Cuban community in Florida, either shipped live to Caribbean or U.S. markets, or processed through a central abattoir in a major population center like Port-au-Prince and frozen carcasses shipped. A portable abattoir was developed under a USDA grant for Native Americans to process buffalos in order to meet sanitary regulations. Such a device could be modified and adapted for regional use in Haiti.

A similar project was implemented in Indonesia, only *Leucaena*, instead of vetiver, was used for the contour hedgerows and forage source, and credit loans were made available to purchase Indonesian livestock that were required to be tethered and fed by forage by “cut and carry.” The root systems of *Leucaena* hedgerows are not quite as effective as vetiver for controlling erosion. Nevertheless, according to an evaluation of the program, the systems were quite effective and farmers using the contour hedgerow livestock systems became the most prosperous in the region.

Vetiver is not new to Haiti and in some places it is grown to harvest the roots to be processed into perfumes or fixatures for other scents. Because of this, among some in Haiti, vetiver has been unjustly cited as creating erosion rather than halting it. However, this is not a problem in areas that are not within economic hauling distances of existing distillation facilities, or if farming systems are created whereby vetiver roots are only harvested from plants grown only between permanent hedgerows.

Vetiver hedgerows can also be very valuable in preventing erosion and water damage within housing areas (e.g., Cite Sole), and in protecting roads. The hedgerows should be coupled with urban tree planting in housing areas, which could serve as shade as well as a source of food or forage. When planted along embankments and in catchment areas, vetiver hedgerows can also reduce erosion of roadsides. The hedgerows are also extremely important in reducing stream bank erosion and sediment loads in streams, in clarifying water, and in maintaining and increasing year around water flow of springs and streams.

Potential collaborators in Disaster Mitigation

With this present level of interest, it seems to be an opportune time to convene a meeting of interested parties to determine if there is an opportunity to develop a project for a concerted effort in disaster mitigation for that portion SE Haiti ravished by recent flooding.

- USAID's OFDA has already taken the initiative in several areas in Africa (e.g., Kinshasa, DRC) and has proven that funding disaster mitigation projects is a very wise investment and pays off not only by reducing future disasters and outlays by OFDA, but also by stimulating the local economy.
- USAID/Port-au-Prince has taken some steps by investing in tree planting for erosion control, especially in SE Haiti after the recent disaster there.
- Florida Governor Jeb Bush appointed 17 members to the newly formed Haiti Advisory Group. The advisory group will focus on key issues related to Haiti's reconstruction including economic development, education, technology and the environment.
- In a recent meeting with Roderick Mackler, Senior Policy and Program Officer, Bureau of Population, Refugees and Migration at the Department of State, it was revealed that their division had received a mandate regarding refugees to create programs to gainfully employ them in conservation corps types of activities.

Much of this information was drawn from a more in-depth paper, "Haitian Civilian Conservation Corps (HCCC): Jobs, Reforestation and Increased Food Production," written several years ago by Michael D. Bengé, Senior Agroforestry Officer, Agency for International Development, who is presently seconded to USDA Forest Service, International Programs division, Washington, DC, Tel: (202) 501-3025; Email: mbenge@fs.fed.us.