

Case Study

Road Stabilization and Erosion Control Using the Vetiver System in the Democratic Republic of the Congo

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ABSTRACT

Vetiver is a plant that was introduced to the Democratic Republic of the Congo (DRC) in colonial times to mark the boundary of land parcels and cropping lands. At that time, its use for erosion control and infrastructure stabilization was not yet known or practiced. It wasn't until the period 2004-2006 that the vetiver system began to be promoted by The Vetiver Network International (TVNI) via a USAID-financed grant to the US-based NGO, Innovative Resources Management (IRM).

Today very few demonstration sites exist in the DRC due to a lack of funding. The small number of demonstration sites has illustrated the efficiency of this technology for erosion control and infrastructure stabilization. These sites have attracted two private sector construction companies, SOGEA-SATOM and Malta-Forest, to incorporate vetiver technology into their projects over the past two years on National Highway #1 between Kenge and Kikwit in Bandundu Province and in Kinshasa for an urban erosion site in the Selembao residential quarter. The Belgian Technical Cooperation agency (CTB) also has shown its desire to incorporate vetiver technology into its projects. It has funded a vetiver nursery in the city of Mbuji-mai in Kasai Oriental Province in central DRC. Slowly but surely, vetiver systems are becoming better known to the citizens of the DRC as well as to the donor community.

Why is the Vetiver System of Interest in the DRC?

Rainfall characteristics for certain cities in the DRC, the Kinshasa case

The DRC has several climatic zones: equatorial and low land with typical tropical climate, and temperate mountainous regions. It is in these first two zones that high rainfall caused severe soil erosion in the extended urban areas. In 2007 and 2008, the period between October and December, there were periods of heavy rainfall in Kinshasa, in the Selembao quarter in excess of 80 millimetres in less than 5 hours. This type of intense rainfall causes severe erosion in urban areas.

Other principal causes of soil erosion

- Destruction of vegetative cover and out-dated construction without urban planning
- The absence of adequate and effective protection for infrastructure
- Lack of maintenance on existing infrastructure (case in point, the Nzinda road and roads in Bas Congo province)

The reasons for using vetiver technology for infrastructure protection and erosion control

- Deep root system (more than 2 meters deep), dense and rigid stems and leaves that solidly fix the soil in place
- Very rapid vegetative growth
- Stem and leaf biomass provides good soil coverage and slows the speed of water runoff due to rainfall

The use of vetiver for infrastructure protection and erosion control in the DRC

- *Nursery production of vetiver plants:* It is an important part of any extension/promotion program as this is needed to allow for the easy distribution/sale of planting material to project sites dealing with erosion control
- *Establishment of demonstration sites* to illustrate the use of the vetiver system in the DRC

Use of the vetiver system to stabilize city drains and other erosion control projects in Kikwit, Bandundu Province (funded by USAID, CLIFS Project implemented by IRM)

- **Benching steep slopes in urban ravines**

Urban ravine slopes are usually very steep and slippery and usually greater than 45 degrees. Under these conditions, the slopes are unstable and land slippage and movement of rocks and soil down the slope often occur until some kind of equilibrium is attained. It is therefore difficult if not impossible to plant vetiver hedges along the contours lines. In this kind of situation, benching is needed and consists of creating terraces on the steep slopes along the contour lines not only to facilitate planting vetiver hedges but also to better stabilize the slope avoiding future slope collapse. It is much easier to create benches on clayey or clay loam soils. Trying to create benches on sandy slopes is much more difficult.

- **Actual planting of vetiver slips**

Slip preparation:

- Split clumps of slips apart in groups of three slips. Cut the leaves off, leaving about 20 cm of leaf remaining above the crown, and cut the roots down to 10 cm in length. Prepare a shallow trench of about 20 cm deep and 15 cm wide following the contour lines and perpendicular to the flow of water down the slope. The spacing between hedge rows (spacing between the trenches) should not be more than 1 meter due to the nature of heavy rainfall and the need to create successive roughly parallel hedge rows as you move down the slope.

- Fill the trenches with compost and farm yard manure or other organic matter to enrich the trenches as much as possible prior to planting

- Plant the vetiver (in groups of three slips) with a within-the-row spacing of 10-15 cm.

Observations and periodic upkeep for the site

- During the first month after planting, make sure that all the plants are growing and replace any that die during this initial period

- During the second month after planting, continue to monitor overall growth and add side-dressed fertilizer as needed based on visible plant vigour.

Use of the vetiver system to protect the road embankments along National Highway #1, Lot 4, Kenge-Masimanimba segment, in Bandundu Province (consultant to SOGEA-SATOM, with financing from the BCMI and the World Bank)

In the case of vetiver use along newly rehabilitated roadways, the work is much easier as the embankments have been graded by the construction company allowing relatively easy access and are normally done following road construction standards. In this case the main activity is to mark out the hedge row lines on the embankments and along the contour lines. As with stabilization of urban ravines, the distance between hedge rows should not be more than 1 meter especially in high rainfall areas. This will allow the establishment of vegetative barriers fully able to stop erosive runoff especially given the very high rainfall that occurs in this site.

The same technique is used for planting vetiver along roads as it is for urban ravines. The upkeep and maintenance is also the same as well.

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Brief Introduction to the Speaker

Alain N'donga is an Engineer and a private consultant and TVNI Representative in the Democratic Republic of Congo. He has coordinated extension, promotion and technology transfer for the vetiver system in the DRC. He is one of the first technicians in the DRC to use vetiver as a bioengineered solution to problems facing the country. During the last four years, he has done extensive erosion control work especially for infrastructure stabilization (road embankments, slope stabilization, urban ravine stabilization ...) using vetiver technology. His work has been very successful and personally satisfying attracting the attention of the general public who are curious about the effectiveness of vetiver systems. Currently, he works as a consultant for EGIS-BCEOM International (a French consulting company and quality control service for civil works) where he is responsible for all aspects linked to the establishment of vegetative cover at project sites.