

## **VETIVER AND NATURAL DISASTERS: THE DOI TUNG EXPERIENCE**

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### **Abstract**

Gullies on roadsides, back slopes and cut and filled soil surfaces including those caused by the changing course of water flows were successfully stabilized using vetiver grass technology methods. Houses, public buildings and fruit orchards were similarly saved from landslide hazards. However, precautionary measures had to be implemented. The establishment of vetiver hedges on all cut and filled soil surfaces has been very effective in stabilizing the soil. Intensive care including the application of compost, chemical fertilizer and irrigation, whenever possible, has been very beneficial to ensure the survival of vetiver on infertile land at critical sites with steep slopes within one to two years. From then on, naturalization of endemic plant species among vetiver grass was found to complement soil stabilization and save on costs. There was no need to maintain the mono-cultural hedges after they had done their pioneering duty.

### **Introduction**

At the Doi Tung Development Project in Chiang Rai, Northern Thailand, soil stabilization of the back slopes and side slopes of new roads, using several engineering approaches, including hydro-seeding, was conducted during 1989-91 at extremely high cost. At the initiative of Her Royal Highness the Late Princess Mother following His Majesty the King's suggestion, vetiver grass was introduced in 1992 to the project. The World Bank publication on vetiver was used as a guideline for soil erosion control and retention of soil moisture. Extensive propagation and establishment of vetiver hedgerows for soil conservation were implemented during 1992-1995. The cost efficiency of vetiver propagation and hedgerows establishment was carefully studied (Sayamanonta 1996). Root characteristics and distribution studies using the P32 isotope technique (Mahisarakul et al. 1996), and vetiver hedges as barriers to prevent residues of harmful agricultural chemicals to enter the watershed, were conducted in the project area (Pinthong et al. 1996).

### **Landslides Caused by Road Construction**

In the rainy season of 1996, heavy rainfall caused landslides and the collapse of roadside and back slopes, including those with cement-sprayed metal netting walls. Landslides caused damage to houses and public buildings. When the rainy season ended, land leveling to create terraces of vetiver hedgerows and hydro-seeding were implemented to stabilize the newly formed gullies. Reinforcement of friable loose soil using cement beams arranged in squares to support the wet soil weight and other engineering methods have been practiced whenever and wherever needed at critical sites. In all cases, vetiver hedgerows have been fertilized, selectively weeded, and pruned for one to two years, then the local plant species have been allowed to naturalize among vetiver grass, compete and finally dominate the site. By then, vetiver was no longer needed.

### **Vetiver for Soil Stabilization to Save Buildings and Houses from Landslide Disaster**

At Huai Nam Khun village during 1989-1991 when a new highway was built for the Doi Tung Development Project, soil was excavated from the foothill for road construction. A large flat land area was left available after the construction was completed. A new temple, a nursery and daycare centre and houses were built next to the back slopes newly carved off the foothill. No precaution was taken against soil erosion and landslide. During 1994-1996 there were landslides of the bare back slopes at

the foothills. Several houses were buried and a few people died in these incidents. To save all remaining buildings, the back slopes were leveled into terraces, vetiver hedgerows were planted and Bermuda grass was hydro-seeded in the dry season. Vetiver grass and hydro-seeds were regularly irrigated. By the time the rainy season started vetiver hedgerows were already well established and the Bermuda grass provided cover to reduce the impact of falling raindrops making splash erosion. Due to poor soil fertility, compost and chemical fertilizer were applied for the first six months. At the end of the rainy season, natural local plant species were found among vetiver and Bermuda grass. Selective weeding to get rid of vines was done annually for the first two years. Within four years the natural vegetation was very dense and the back slope was stabilized.

### **Landslides Caused by the Diversion of Waterways**

From our experience of road building on the mountain during 1989-91, we made an attempt to save the vegetation on the side slopes by transporting the excess cut soil from the construction sites and filling it into a valley to create flatland. When the filling work was completed, vetiver hedgerows were planted as a living retention wall from the ridge of the newly formed plateau and along the side slope of the landfill. The original creek was replaced by a man-made draining dish. The water from the dish was drained at the corner between the ridge of the landfill and the slope of the hillside down the steep slope. In the rainy season the impact of strong water currents on the friable soil of the hillside caused continuous landslides and slumps of the hillside for many consecutive years. A large, deep gully was created at the draining point, upper and lower on the slope of the hillside.

Another landslide similar to the previous one took place at the foothill on the bank of an irrigation canal. It was caused by the impact of water currents on the foothill. The collapse of the foothill caused landslides and slumps in the lychee orchard above it.

In both cases vetiver hedgerows were planted on the gullies early in the rainy season because the places are not accessible for irrigation to be carried out. Replanting was done after heavy rain because vetiver plants were washed away. Three, four years after starting the vetiver hedgerows, the gullies have been almost fully stabilized, with the exception of the areas on the ridges. The natural vegetation of local species has begun coming back among vetiver hedgerows from the lower part of the gullies upward.

### **Vetiver and Prevention of Landslides**

In the entire construction project on Doi Tung since 1992, right after the earth cut and fill works were completed, vetiver contour hedgerows have been planted on the critical sites in the dry season and irrigated to ensure their survival. Their establishment during the dry season has always increased their soil stabilization ability in the following rainy season. The intensive care of vetiver hedgerows including fertilizer and compost application still costs less than traditional engineering methods and even less than planting vetiver hedgerows in the rainy season and suffering from runoff water washing away vetiver plants. After a couple of years of selective weeding and pruning, naturalization of local plant species follows and the soil is stabilized. When vetiver is planted in places non-accessible for water transport, planting vetiver hedgerows in the early part of the rainy season is recommended.

### **References**

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