Identifying the Optimum Land Coverage Practices for Reducing Soil Erosion in the Ugum River Watesheds Using a Newly Developed GIS Based Erosion Potential Model

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Surface runoff and sediment losses from soil erosion are major contributors to reductions in surface water quality and subsequent degradation of the coral reefs in Southern Guam. A study of the Ugum watershed in this part of the island indicates that soil erosion from vegetated savanna grassland is around 70 tons ha^{-1} yr^{-1} but can be as high as 547 tons ha^{-1} yr^{-1} in unvegetated sloping sites known as "badlands". In contrast, agricultural lands in the Ugum watershed have an average soil erosion loss of 45 tons ha^{-1} yr^{-1}. Additional problems associated with soil erosion include loss of soil productivity at the eroded site, reduced water storage capacity in streams and lakes, and loss of wildlife habitat. The negative impact of sediment loading on the aquatic environment of Guam is well documented. Several researchers have clearly demonstrated that coral reef decline associated with sediment deposition is directly linked with a reduction in the quantity and quality of solar radiation. Corals growing in areas subjected to high sediment loads in stream runoff are especially vulnerable. Undesirable effects associated with the degradation of coral reefs include declining fish populations and a negative impact on tourism.

Effective land use planning and the implementation of proper erosion control measures requires: 1) a basic understanding of runoff and erosion rates at the plot, on hill slopes, and at small catchment scale and how these rates vary across the landscape, 2) a means of identifying areas that have the potential for high soil erosion, and 3) a means of implementing proper soil reduction practices that are both effective and economic.

For the past several years, various agencies such as the Natural Resources Conservation Service (NRCS) and the Guam Department of Agriculture have been implementing erosion control practices by carrying out extensive tree planting programs. However, it is important to investigate: 1) the impact of tree growing in reducing soil erosion, 2) the identification of other kinds of land coverage (e.g., Vetiver grass) that may be more effective in reducing soil erosion, and 3) the cost of applying these erosion reducing alternatives.

The objective of this project was to use a GIS based erosion model, recently developed by WERI researchers, to investigate the effectiveness of various vegetative cover schemes in reducing soil erosion, and attempt to determine the relative costs of applying these erosion prevention schemes.

The benefit of this project is that that NRCS and the Guam Department of Agriculture are now better equipped to choose between soil erosion prevention alternatives in the future.