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Reducing future non-point source sediment and phosphorus loading under intensifying agricultural production in the Ethiopian highlands

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Intensification of agriculture will bring along non-point source pollution in the Ethiopian highlands resulting in eutrophication of lakes. The first signs of eutrophication have been observed already in Lake Tana. The lake it supports the lives of millions in the surrounding through fishing, tourism, transportation and hydropower.Presently, information on non-point source pollution is lacking in the Ethiopian highlands. There are few studies carried out in the highlands on the extent and the source areas of pollution, and models are not available for predicting sediment and phosphorus loading other than those developed for temperate climates. The objective of this chapter is to review existing non-point source studies, report on our findings of sediment and phosphorus sources that are related the non-point source pollution of Lake Tana and to present a non-point source model for the Ethiopian highland based on the Parameter Efficient Semi-distributed Watershed Hydrology Model (PED-WHM).In our research we have found that the saturation excess runoff from valley bottoms and from degraded lands are prevalent in the Ethiopia highlands. The periodically runoff source areas are also the sources for the non-point source pollution and by concentrating best management practices in these source areas we expect that we can reduce pollution without affecting the profitability of the existing farms. The water balance component of the non-point source model has been performing well in predicting both the discharge and the location of the runoff source areas. Sediment and phosphorus prediction models have been developed and are currently being tested for the 7km2Awramba watershed and the 1350 km2Gumara basin. Initial results indicate that 11.2 ton/ha/year sediment load and an accumulation rate of 17.3 mg/kg/year of dissolved phosphorus from Gumara watershed joining the lake. By developing best management practices at this time before non-point source pollution is rampant and having models in place that can predict the effect of no-action, we believe strongly that degradation of the water resources can be minimized and Ethiopia does have to go through expensive cleanup procedures such as in many developed countries.