7. CONCLUSION

The methodology for estimating soil loss established in this report holds strong potential for influencing agricultural planning in developing countries. Remote sensing and soil spectrometry are both inexpensive and rapid means of assessment, and thereby lend themselves to be of particular service to scientists and extension workers operating in areas where capital resources are scarce. In addition, the methodology is fully compatible with geographic information systems and can be expedited where preexisting databases (i.e., of land use, soil types) are already available; or, it can be performed entirely from scratch. ASTER seems to be particularly suited for similar applications because DEMs can be generated from the same images used for estimating vegetation cover; thus rectification does not need to be performed to match DEM pixels with satellite image pixels for soil loss equation inputs. However, provided there are both satellite image(s) and DEM data of a given area, these methods can easily be applied to other remote sensing technology (i.e., Landsat 7, AVIRIS).

As evidenced by results from the case study village of Kambi ya Simba, soil loss estimates do not necessitate ongoing, *in situ* field measurements to function effectively at a qualitative level. Positive trends in crop productivity, soil nutrient content (N and K), pre-harvest crop density, and lower soil loss estimates remain congruent and in accord with ground truth observations, despite the multitude of uncontrollable factors, and therefore belie an explanation of spurious inter-dependence.

The use of certain soil conservation practices, namely vegetated contour ridges, is accompanied by significantly higher crop productivity, greater pre-harvest crop density, and, to a lesser degree, higher soil fertility. Other management practices, whose effects were not assessed remotely or from soil samples, such as manure application and preventing livestock from grazing residues, also exhibit significant, positive correlations to crop productivity. Soil conservation thus appears to be an effective mechanism for maintaining and, perhaps in some cases, increasing crop productivity.

In Kambi ya Simba there is vital need for more extensive soil conservation and agroforestry, and for a reduction in grazing intensity. This is unanimously recognized by farmers, yet socioeconomic forces, possessing unique manifestations throughout the spectrum of wealth, have inhibited their implementation. At the same time, the decision to adopt better methods of land husbandry cannot be viewed as a simple tradeoff between short term capital and long term prosperity. Achieving sustainable agricultural production will not single-handedly improve the standard of living for anyone in the village—among numerous factors, there is inelastic demand for agricultural produce and a high degree of volatility in both the climate and the market price for crops (and, one could add, Tanzania's approach to the agricultural sector). Moreover, it cannot reform the structural inequalities that have relegated the people of Kambi ya Simba to poverty.

However, when the financial resources become available, it is my intention to use this report as a framework, and to work with the farmers of Kambi ya Simba to implement lasting change. Our underlying ambition is not purely to bolster crop

productivity, but to provide families with a greater buffer so they can invest in needs apart from agriculture. While change cannot come rapidly, this report is a first step.