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**Poudel, D.D. "Soil Development and Productivity, and Erosion Management of Steepland Volcanic-Ash Derived Soils for Sustainable Vegetable Production in Mindanao, the Philippines." Ph.D. Dissertation, University of Georgia, Athens, GA, USA. 198 p. 1998.**

Highland vegetable systems in the Manupali watershed, Mindanao, the Philippines are important to supplement the demand for fresh vegetables in lowland cities, but the sustainability of these systems is constrained by declining soil productivity. A farm survey, soil characterizations, field experiments, and erosion modeling were undertaken to characterize vegetable production systems and soils; to test erosion control measures; and to evaluate impact of crop rotation on soil erosion. Two vegetable systems were identified: the Higher External Nutrient and the Lower External Nutrient systems. The former system existed at relatively higher elevations and showed negative profit. Despite a gradient in the degree of soil development across the four geomorphic units, soils were surprisingly uniform in their morphological and physical properties. However, they differed in fertility characteristics. Upper layers of mountain pedons showed 1.7 to 2% oxalate extractable Al, 1.4 to 2.7% oxalate extractable Fe, > 90% P retention, 10.7 to 11.5 pH in NaF, and < 0.9 cm<sup>-3</sup> bulk density, indicating more recent ash cappings on them. Effects of these properties on fertility were evidenced by a high phosphate sorption maxima (14208 µg P g<sup>-1</sup>) and low potassium availability ( $AR_e^K = 0.016 \text{ (moles/l)}^{1/2}$ ). The point of zero net charge was found at 4.2 for Bt and < 4 for Ap and BA horizons. Halloysite, gibbsite, goethite, hematite, and cristoballite were common clay minerals. Base saturation was low and decreased with depth. Averaged over 2.5 years, the framers' practice of up-and-down planting showed the highest annual soil loss of 65.3 t ha<sup>-1</sup> compared to 37.8, 43.7, and 45.4 t ha<sup>-1</sup> for contouring, strip cropping and high-value contour hedgerows, respectively. Phosphorus had the highest average enrichment ratio of 4.7. Soil qualities differed between the slope positions of 19 m long erosion-runoff plots. Crop yields downslope were about 50% greater than those upslope. Tomato-cabbage-tomato cropping sequence showed 70 t ha<sup>-1</sup> greater simulated annual soil loss than cabbage-tomato-cabbage. High-value contour hedgerows, multiple cropping that includes corn or cabbage rather than tomato at the most erosive period of the year, and appropriate soil fertility improvement measures are suggested to improve the sustainability of these systems.

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