

RELATIONSHIP BETWEEN EROSION AND SOIL PHYSICAL
PROPERTIES OF TEMPERATE AND TROPICAL SOILS

A THESIS

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ABSTRACT

PADILLA WASHINGTON A. Relationship Between Erosion and Soil Physical Properties of Temperate and Tropical Soils. (Under the direction of Dr. William E. Larson).

Three soils, Inceptisol, Mollisol and Oxisol, having large differences in physical and chemical characteristics were subjected to simulated rain in the laboratory. Physical and chemical analyses were conducted on representative samples to develop relationships between soil loss and soil physical parameters. The effect of clay as a binding agent in the improvement of the stability of surface soil aggregates to control soil water erosion was also evaluated. Aggregate stability appeared to be one of the most important parameters with high influence in controlling soil loss in the three soils. The infiltration rate of the Oxisol and Inceptisol soils decreased more gradually than the Mollisol soil and became constant at a higher final rate. The improvement of soil aggregates tended to increase the soil infiltration capacity, while the increase of the clay content without improving the aggregation tended to decrease this capacity and increase runoff and soil loss. On the average the splash soil losses for the Inceptisol, Mollisol and Oxisol soils, were as much as 12, 7 and 19 times than those found in the runoff water. On the average the runoff of the Mollisol soil was 48% of the rainfall as compared with 20 and 9% from the Inceptisol and Oxisol soils respectively. A decrease in water runoff was observed as the aggregate size increased but it decreased as the percent clay in the sample increased. The Mollisol soil appeared to be the most susceptible to water erosion when compared to the other two soils. As

runoff began, soil loss rates increased rapidly for all three soils to an initial peak rate, then gradually decreased to fairly constant rates. The addition of clay produced no significant changes in soil loss, inspite a linear increase was observed. The addition of chicken manure to the samples with aggregates less than 0.5 mm decreased soil loss and increased the infiltration rate as well as their aggregate stability. Aggregate stability index and saturated hydraulic conductivity showed to be good predictors when were included in a soil loss regression model.