SURFACE EROSION CHARACTERISTICS OF THREE MANAWATU SOILS

A THESIS

PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE

OF

MASTER OF AGRICULTURAL SCIENCE

IN SOIL SCIENCE

AT

MASSEY UNIVERSITY

LACHLAN GRANT

1992

Abstract

Sheet erosion is the most extensively mapped erosion type in New Zealand. With the current financial returns from pastoral framing, land which was previously unaffected by sheet erosion is being cultivated and therefore becoming more susceptible to sheet erosion.

The main objective of this study was to assess quantitatively, under the same conditions of slope, cover, and rainfall, the erodibility of three soils which are suitable for either arable farming or market gardening. Whether the eroded sediment consisted of sand, silt or clay particles, or more predominantly aggregates of these primary particles was also determined.

The three soils examined were from the Manawatu region and included the Kiwitea silt loam (Dystrochrept), Levin silt loam (Dystrochrept) and the Tokomaru silt loam (Fragiaqualf). A portable rainfall simulator was used to generate runoff and sediment from soil packed in 0.2 m^2 trays. All "storms" were for 60 minutes in which 65 mm of rain was applied. Particle selectively was determined using pipette analysis methods and a settling tube.

Quantitatively comparing the erodibility of the three soils, it was found that the Levin soil was the most erodible and the Kiwitea was the least erodible. If the same storm intensity and soil conditions were to occur over a large area, one hectare could produce 6.4, 17.6 and 10.3 tonnes of sediment from the Kiwitea, Levin and Tokomaru soils respectively. Soil particles and aggregates were selectively removed by rainsplash and overland flow. The proportion of sand particles present in the eroded sediment was always lower than the original soil due to the inability of sand particles to be entrained by overland flow. Silt particles were easily detached and were most commonly eroded as individual particles. Clay particles were eroded and transported in the form of aggregates, a result of their binding properties. The size distribution of eroded sediment became progressively coarser over the rainfall period. This was because initially there was insufficient runoff energy available to transport the larger particles. A vegetative cover severely reduces the volume of runoff and the amount of sediment eroded by cushioning the raindrop impact.

Acknowledgements

I express my sincere thanks to my supervisor Mr. M.P. Tuohy for his guidance and assistance during all the stages of my work.

I am also grateful for the assistance given to me by the following:

-Doug Grant for his time and effort during the preparation of this manuscript

-The Technical Staff from the Department of Soil Science

-Kevin Harris, Senior Technical Officer for the Faculty of Agricultural and Horticultural Sciences, for the use of his office and computer resources.

Finally, I would like to Acknowledge the never-ending tolerance, encouragement and support from my family and friends, especially my parents.

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