



ISAE 2011



International Symposium on Agriculture and Environment

November 09, 2011

"Green Technologies for Sustainable Development"

Proceedings

*Faculty of Agriculture
University of Ruhuna
Sri Lanka*

Aggregate stability of soils as affected by animal manure

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Abstract

Soil aggregates are a set of soil particles which binds together more strongly than with other particles. Aggregate stability refers to the ability of soil aggregates to resist disruption when outside forces are applied. Aggregate stability is generally correlated with soil organic matter and clay content. The objective of this study was to determine role of different animal manures in improving wet aggregate stability of soil. Cow dung and goat dung were used in this experiment as animal manures. Air dried, ground, and sieved cow dung and goat dung were mixed with air dried and sieved forest soils separately to obtain 0, 5, 10, 25, and 50% ratios (36.84 with 5% to 700 kg/ha with 50%). The artificial soil aggregates were prepared using 2.3 x 2.5cm plastic tubes to measure the percentage of water stable aggregate. Water content of the aggregates were varied from 20 to 35%. Wet sieving method with a single sieve size of 2mm in diameter at a rate of 20 oscillations per minute for 1 minute was used to evaluate aggregate stability. Water stable aggregate percentage in the soil mixed with cow dung was lower compared with that of soils mixed with goat dung. Results showed that 10, 25, and 50% goat dung added soils obtained higher water stability of aggregates. Results showed that addition of cow dung did not improve aggregate stability in a considerable manner. To obtain higher aggregate stability, addition of 50% cow dung would be necessary, which would be economically and practically impossible. Aggregate floating occurs when air dried aggregates do not permit water to enter into the aggregate immediately. Air trapped in intra aggregate pores lowers the density of aggregates, making aggregates to float in water. Soils mixed with cow dung had a short aggregate floating time compared with that of soils mixed with goat dung. Therefore, goat dung may have a risk of the removal of floating low density aggregates with runoff water, which may consequently resulted in increasing topsoil erosion. Cow dung does not show the risk of the removal of floating aggregates with runoff water. Addition of 10, 25, and 50 percent of goat dung was found to provide nearly similar aggregate stability. Therefore, 10% goat manure (77.7 kg/ha) was considered most suitable to add in to soils for improving aggregate stability.

Keywords- Aggregate stability, organic matter, animal manure

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