



Integrated Agro-forestry Systems to Reduce the Risks for Soil Erosion and Land-sliding in Serayu Watershed - Indonesia

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Serayu is a watershed in Indonesia. Due to extreme geo-morphological and climatic conditions as well land use, Serayu is very susceptible to landslide and soil erosion.

Land use in Serayu is dominated by intensive agriculture (66%), with potatoes as the main crop in the upstream of Serayu while agroforestry and natural forests together only account for 21 % of land use. Intensive farming has caused land degradation such as soil erosion, soil and water pollution by pesticides. Soil erosion has dramatically declined potatoes yields (from about 30 t ha⁻¹ to 12 t ha⁻¹) in recent years.

Integrated agriculture-forestry systems (agroforestry) receive increased attention, as they promise to reduce soil erosion and land sliding, thereby increasing the sustainability of the production system and preserving the environment.

To evaluate this hypothesis, we compared different land uses and management strategies in the Serayu watershed i) intensive farming, ii) agro-forestry and iii) natural forest. For this, we examined biophysical soil properties (texture, structure, particle density, bulk density, porosity, root biomass, and soil organic matter), and investigated the infiltration capacity using double ring infiltration measurements and surface run off. Three micro-catchments covering an area of 20-30 ha were selected. Two automatic rainfall recorders were established in February 2017 for recording air temperature and rainfall intensity in the areas. Three V-notch weirs were built on each micro-catchment and were equipped with data loggers for monitoring water levels.

The organic matter content in the agroforestry system (3.6%) was lower than the farming land (7.5%) due to different management practices, like excessive application of manure by farmers. However, water infiltration capacity was higher in the agroforestry system (470 mm/hour) than in intensive farming (315 mm/h), indicating that surface run off and the risk of soil erosion are reduced compared to conventional farming practices.

More diverse canopy and root structure in the agroforestry system, can contribute to reduce the risk for surface run off, erosion as well as loss of soil organic matter. In contrast, soil that is intensively farmed, lacks retention force from roots, and has a larger risk for land sliding, especially on steep slopes.