



Terraced agriculture protects soil from erosion: Case studies in Madagascar

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Soil degradation is a major concern in Madagascar but quantitative information is not widely available. Due to its impact on the sustainability of agricultural production, there is a clear need to acquire data on the extent and magnitude of soil erosion/sedimentation under various agricultural practices in order to promote effective conservation strategies. Caesium-137 and 210Pbex fallout radionuclides (FRNs) possess particular characteristics that make them effective soil tracers for erosion studies. After fallout, 137Cs and 210Pbex are rapidly adsorbed onto fine soil particles. But to date, combined use of these FRNs has never been used to document soil erosion in Madagascar.

The study area is located 40 km east of Antananarivo, in Madagascar highlands. Two adjacent cultivated fields have been selected (i.e. a sloped field and a terraced field) as well as an undisturbed reference site in the vicinity of these agricultural fields. Soil samples were collected along downslope transects using motorized corer. The 137Cs and 210Pb gamma analysis were performed at the Institut National des Sciences et Techniques Nucléaires (INSTN-Madagascar) using a high resolution and low background N-type HPGe detector.

Results showed that at the terraced field, 137Cs and 210Pbex inventories reached 145 Bq/m² to 280 Bq/m² and 2141 Bq/m² to 4253 Bq/m², respectively. At the sloped field, the 137Cs and 210Pbex inventories values ranged from 110 Bq/m² to 280 Bq/m² and from 2026 Bq/m² to 4110 Bq/m², respectively. The net soil erosion determined for the sloped field were 9.6 t/ha/y and 7.2 t/ha/y for 137Cs and 210Pbex methods, respectively. In contrast, at the terraced field, the net soil erosion rates reached only 3.4 t/ha/y and 3.8 t/ha/y, respectively.

The preliminary results of this research highlighted that terraced agricultural practice provides an efficient solution to protect soil resources of the Malagasy highlands.