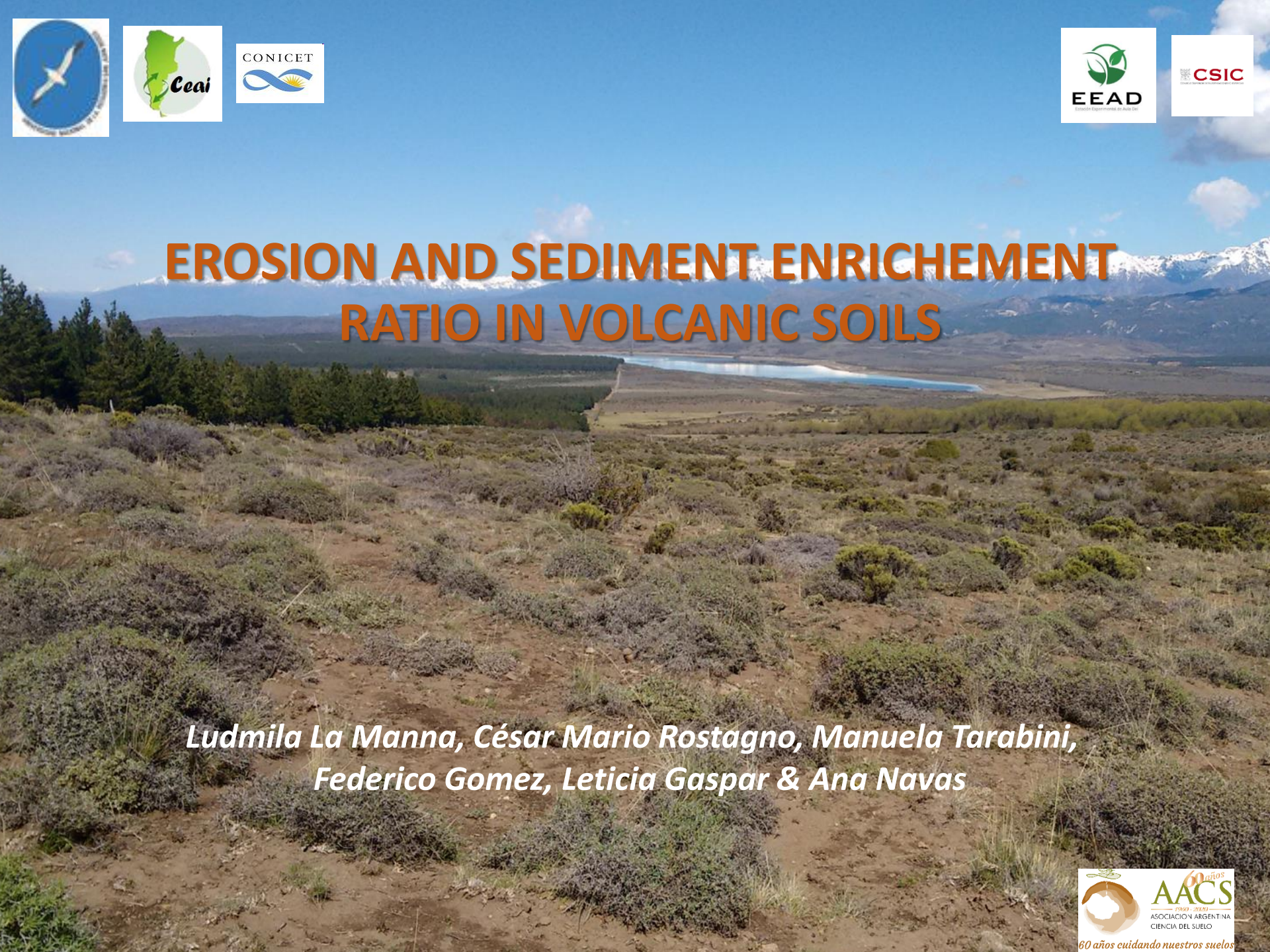


EROSION AND SEDIMENT ENRICHEMENT RATIO IN VOLCANIC SOILS

Ludmila La Manna, César Mario Rostagno, Manuela Tarabini, Federico Gomez, Leticia Gaspar & Ana Navas

60 años cuidando nuestros suelos

Study area

The study area is located in the south west of Argentina, near to Esquel city, Chubut Province, Patagonia.

Pluviometric gradient

The Patagonian Andean Region is characterized by a marked west-east pluviometric gradient, which is evidenced in soils development and vegetation physiognomy. This gradient can be as high as 50mm/km.

Forest	Ecotone	Steppe

The ecotone

The subhumid sector, which corresponds to the transition (ecotone) between the Andean forests and the Patagonian steppe, has suffered the highest human pressure, accelerating the soil erosion processes.

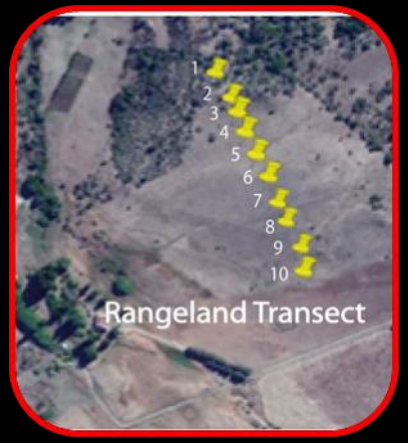
Volcanic Soils

Soils are mainly developed from volcanic ashes. These soils have high chemical and physical fertility.

However, they resulted highly erodible…

Soil erosion

According to studies based on fallout radionuclides (Caesium-137), soil losses in the last 50 years were higher than 30m^3 ha^{-1} $year^{-1}$ under different land uses



La Manna L, Gaspar L, Tarabini M, Quijano L & Navas A. 2019. ^{137}Cs inventories along a climatic gradient in volcanic soils of Patagonia: potential use for assessing medium term erosion processes. CATENA 181: 104089. https://doi.org/10.1016/j.catena.2019.104089

Simulated rainfall assays

Soil erosion

Rainfall simulation experiments showed that potential erosion rates can be very high, varying according to soil characteristics (such as texture and presence of non-crystalline materials), soil cover and land use.

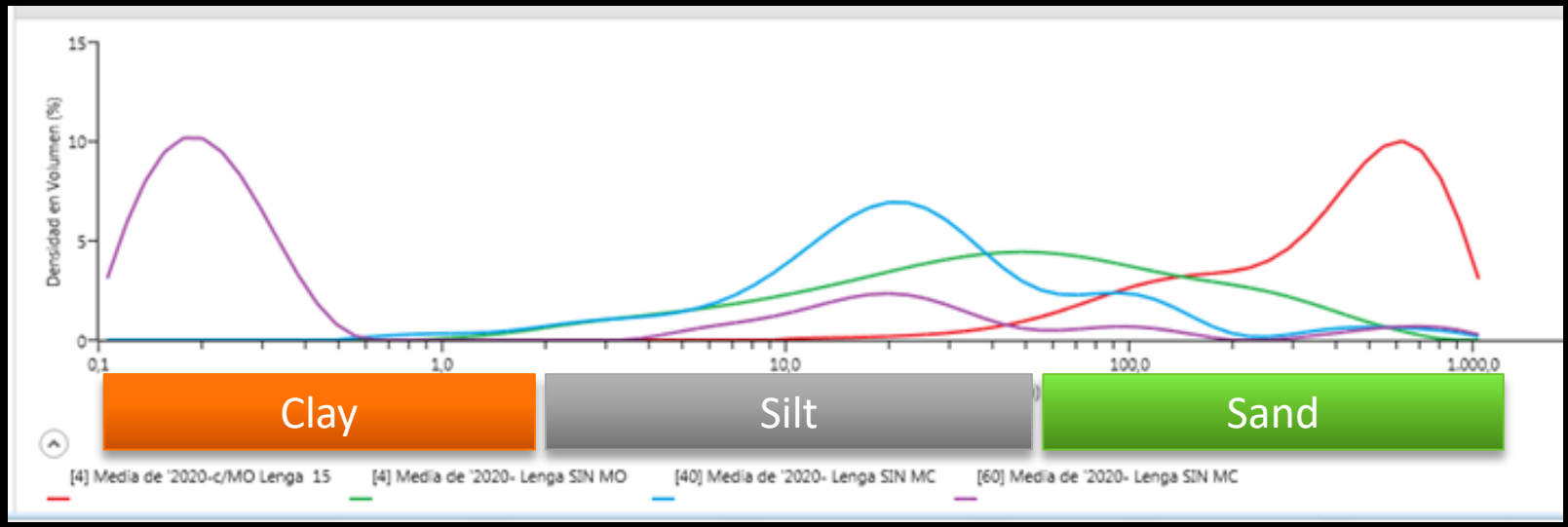
La Manna L, Buduba CG & Rostagno CM. 2016. Soil erodibility and quality of volcanic soils as affected by pine plantations in degraded rangelands of NW Patagonia. European Journal of Forest Research 135 (4): 643-655. https://doi.org/10.1007/s10342-016-0961-z

Soil erosion

In these volcanic soils, soil losses involved mainly the detachment of soil micro aggregates rich in organic matter.

Soil Microaggregates

Soil Granulometric determination by laser difraction with different pre-treatments



Soil without pretreatment

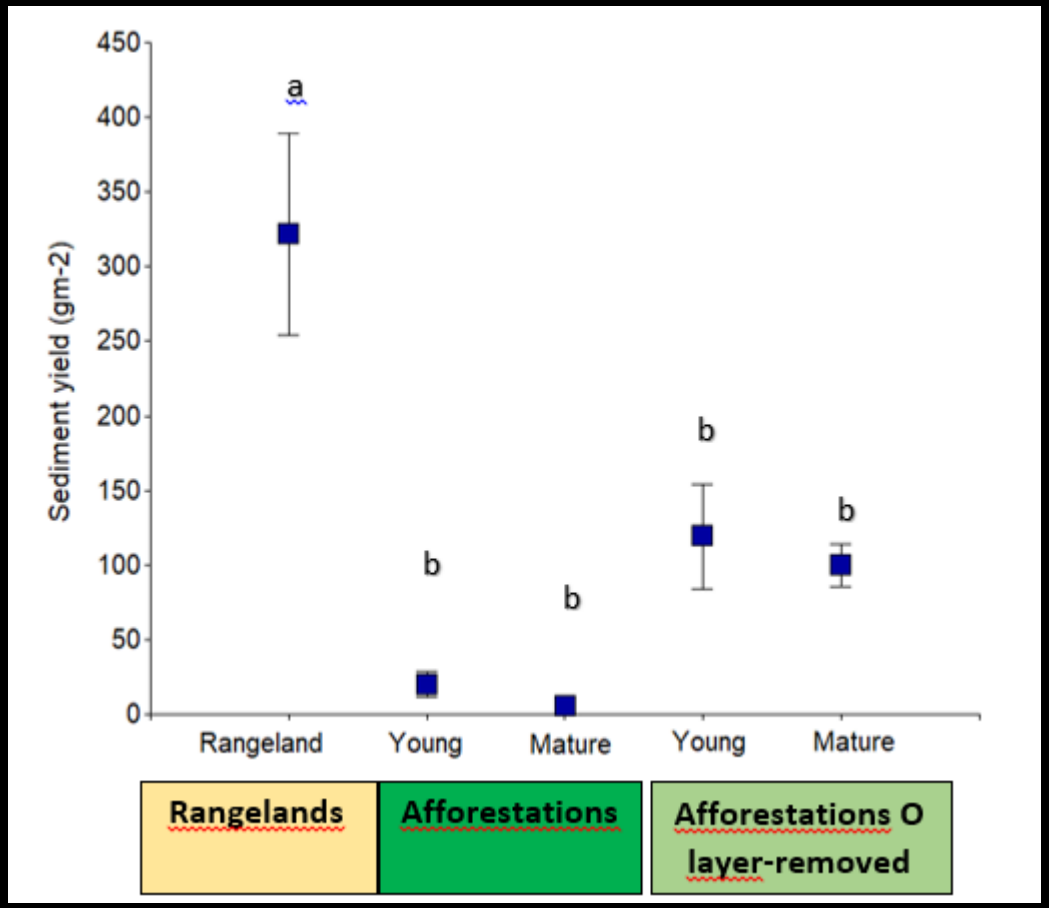
Pretratment: Organic matter elimination

Pretreatments: OM elimination + Ultrasound160 Joules cm^{-3}

Pretreatments: OM elimination + Ultrasound 360 Joules cm^{-3}

Soil is formed by highly stable microaggregates

Afforestations for controling soil erosion

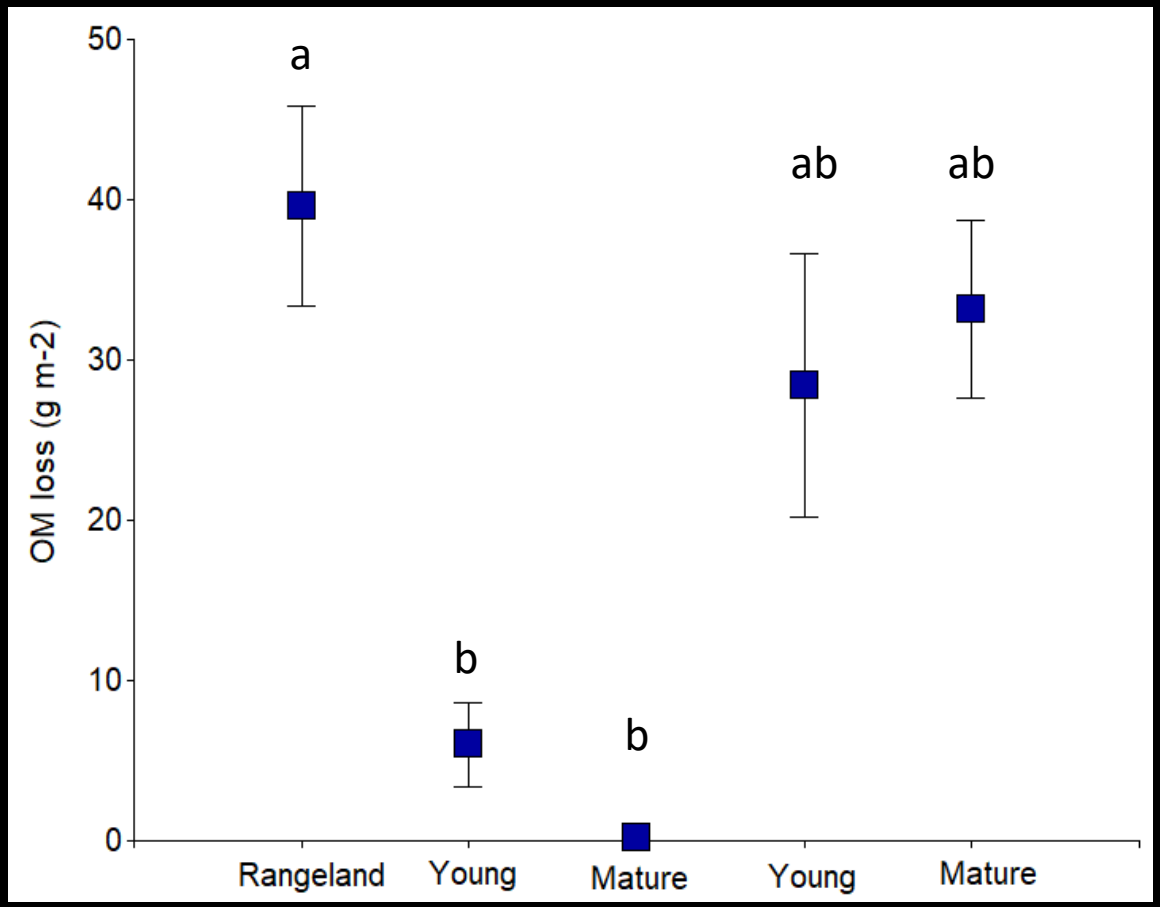


Potential erosion rates significatively decrease where degraded rangelands are replaced by conifers afforestations, even if the fresh litter and duff layers are completely removed.

Simulated rainfall assays

Rain fall intensity: 100mm h^{-1} for 30 minutes; Drop diameter: 2,5mm; Drop velocity: 5,3 m s^{-1}

Organic matter loss…



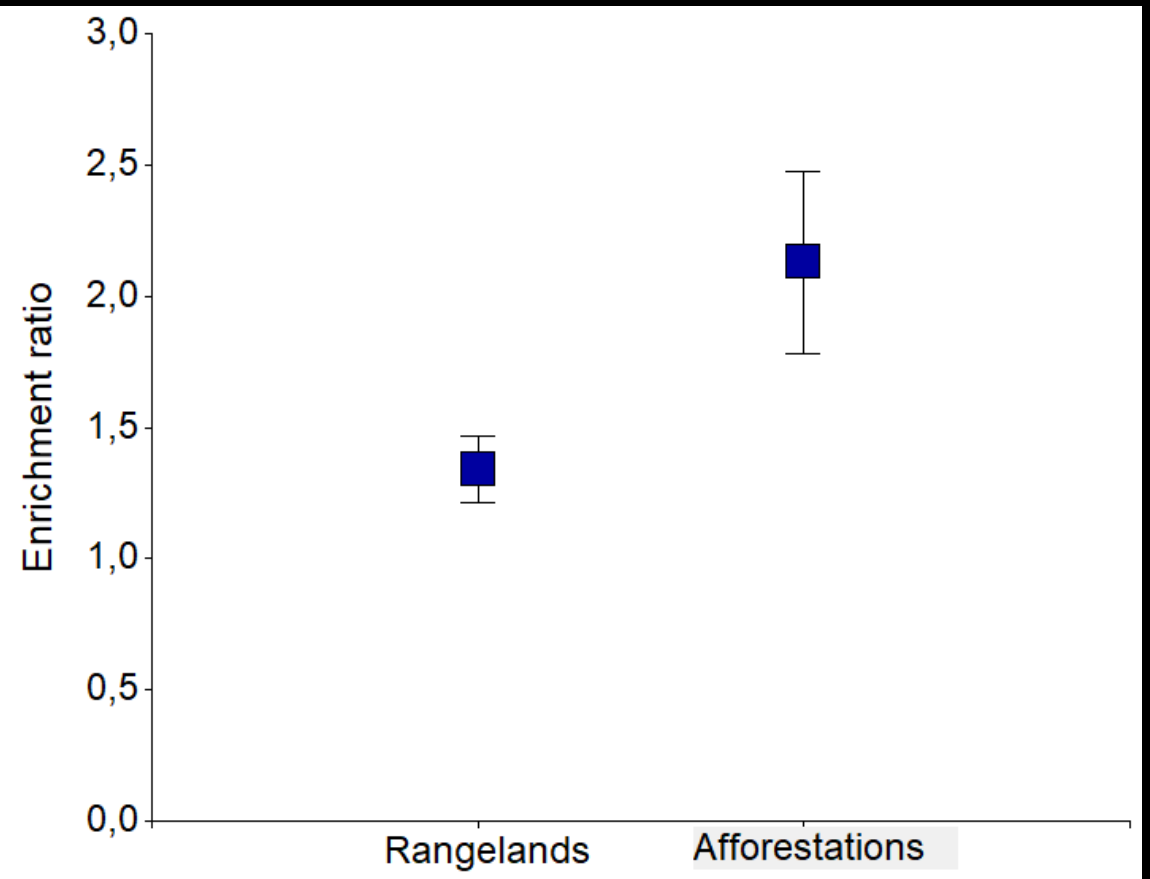
Total organic matter loss significatively decrease only in afforestations where the soil was totally covered by litter and duff layers.

Rangelands	Afforestations	Afforestations O layer-removed ns

Simulated rainfall assays

Sediments enrichment ratio

Sediments enrichment ratio was always higher than 1, with higher values in afforestations than in rangeland soils. Maximum values recorded were 1.7 in the rangelands and 3.8 in a young afforestation.



Simulated rainfall assays

The erosion studies performed evidenced the high erodibility of volcanic soils when their cover is lost, and the close relationship between erosion and carbon losses in these systems.