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# Evaluation of soil erosion and sediment sources in two contrasting sub-basins, using fingerprinting and 137Cs techniques in Uruguay. Preliminary results.

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The study site consists of two sub-basins (“Arbolito”, 20.94 km2; and “Horno”, 10.44 km2) divided by the Rolon stream, which in turn flows into the Baygorria hydroelectric dam reservoir (-32.77152 S; -56.84093 W). The "Arbolito" sub-basin consists of natural pasture with extensive cattle from the 19th century to the present day.  Soils are predominantly eutric brunosols and clayey haplic vertisols with slopes > 6% (MGAP, Uruguay). The “Horno” sub-basin consists of intensive agriculture since the mid-1980s, with a history of rice, wheat, oat, soybean and pastureland rotations. At the beginning of the 2000s, direct sowing began in this region of the country. Soils in Horno are predominantly clayey, deep Haplic Vertisols and Typical Eurethric Brunosols, clayey silt, vertically and moderately deep, with slopes ≤ 6 % (MGAP, Uruguay). Both soil types and their formation are associated with basaltic lithologies. A total of 50 surface samples from natural pastures, cropland and channel banks were used as sources to describe the mixture of sediments (fine-bed material) using geochemical elements and the FingerPro mixing model. For the 137Cs technique, a total of 120 surface samples were taken, multi-transect sampling was conducted in both sub-basins, and reference sites were established. Profile Distribution Model (PDM) and Diffusion Model (DM) were used as conversion model for the Arbolito sub-basin, while Mass Balance Model II (MBM II) was used for Horno sub-basin. MODERN model was used in both areas. Sediment fingerprinting results showed that the proportion of sediment sources is divided as follows: cropland (up to 70%), pastures (up to 25%) and channel banks (the remaining 5%). The reference value of 137Cs found was 369.0 bq.m-2 (SD 7.4 bq.m-2) on 01/01/2020 calibration date. The results of the net soil redistribution rates using different conversion models of 137Cs were consistent with each other, and showed erosion in both sub-basins, Arbolito: PDM (-0.72 Mg ha-1 yr-1), DM (-0.29 Mg ha-1 yr-1), MODERN (-0.69 Mg ha-1 yr-1); Horno: MBM II (-0.5 Mg ha-1 yr-1), MODERN (-0.56 Mg ha-1 yr-1). Although the net erosion rate in both sub-basins is similar, the redistribution of soil within each sub-basin is different. While the Arbolito shows on average preserved areas at the top of the slopes (MODERN 1.7 Mg ha-1 yr-1), with high erosion in the middle (MODERN -5.7 Mg ha-1 yr-1) and low erosion in lower areas (MODERN -0.47 Mg ha-1 yr-1); Horno sub-basin shows in average eroded areas at the top of the slopes (MODERN -4.3 Mg ha-1

yr-1) with low sedimentation in the middle (MODERN 0.4 Mg ha-1 yr-1) and high sedimentation in the lower areas (MODERN 2.21 Mg ha-1 yr-1). This would explain a greater redistribution of the soil from the high to the low areas in the Horno sub-basin compared to Arbolito, probably due to the mechanical movement of the soil by agriculture practice. These results may explain a greater export of soils in Horno compared to Arbolito, which agrees with cropland as the most important source of sediments (up to 70%) by fingerprinting techniques.