# Carbon redistribution by erosion processes in intensively disturbed catchment

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# Introduction

530 mm year$^{-1}$

TOC erosion 0.04 (Mg ha$^{-1}$ yr$^{-1}$)

54% forest 20% agriculture

4 % of C stock lost by erosion in 27 years, 0.15 % per year

279 mm year$^{-1}$

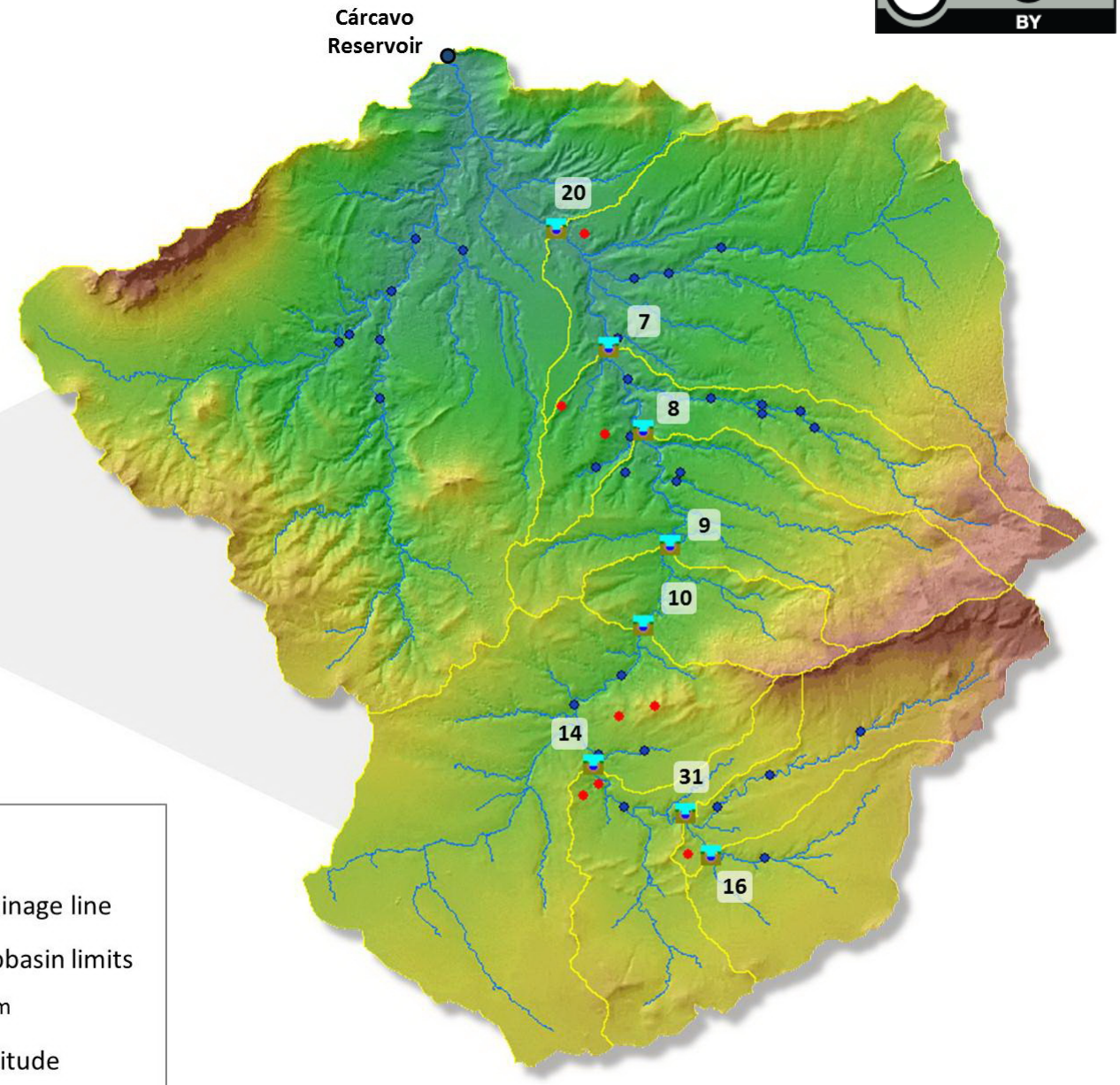
TOC erosion ?

52% forest 39% agriculture

? of C stock lost by erosion in 21 years, ? per year

# Study area





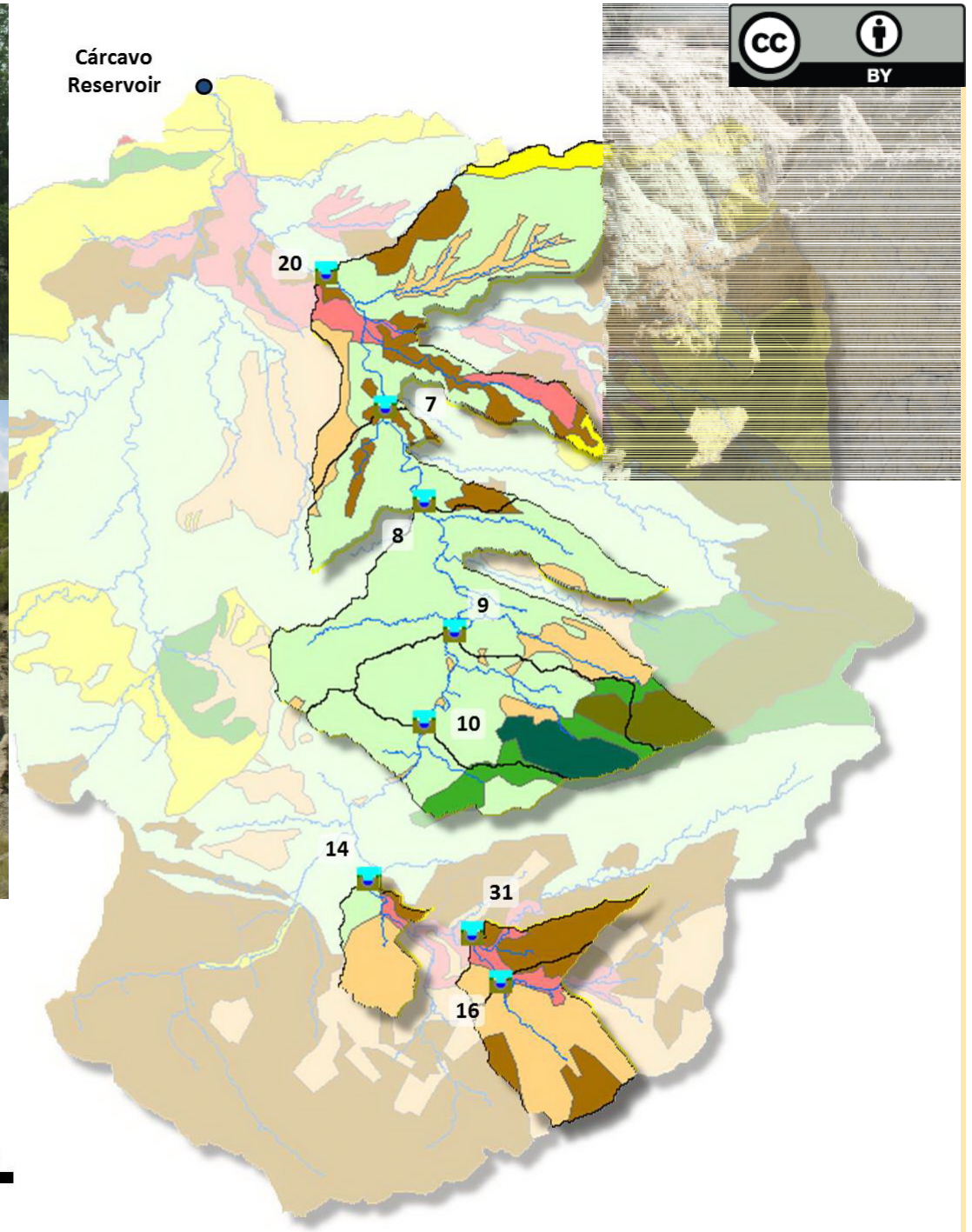

**Sampling areas**

- Sampled alluvial wedge
- Check-dam
- Soil profile
- Drainage line
- Subbasin limits
- 850 m
- Altitude
- 240 m

N

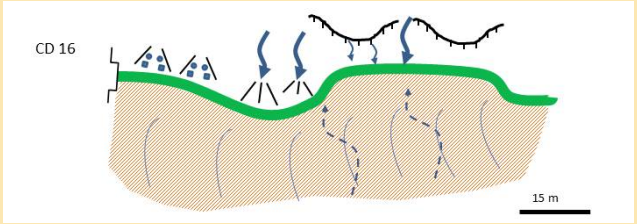
1 Km




Cárcavo
Reservoir
20
7
8
9
10
14
31
16
Low density forest
Agricultural cereal
Agricultural tree
Gullies
Initial reforestation
Shrubland
N
1 Km

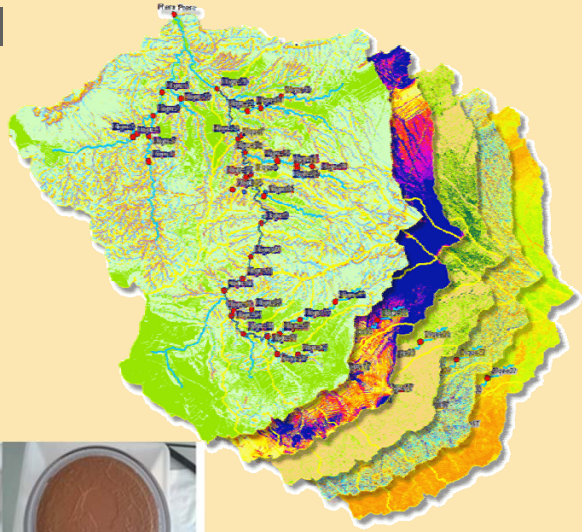
Methods

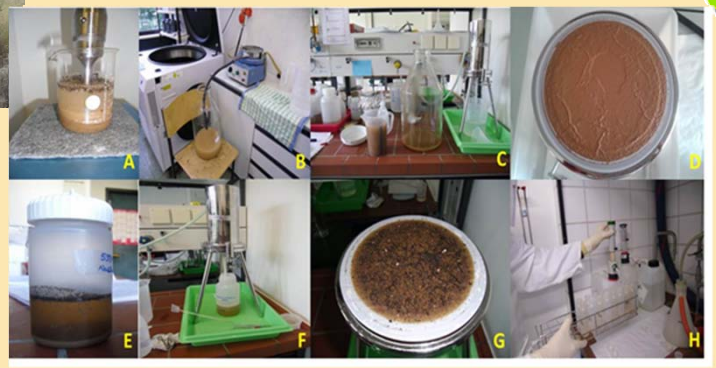
# 1. Field work + 2. Laboratory analysis + 3. Spatial analysis




Soil and sediments POC, MAC, $^{137}$Cs, texture and other physico-chemical properties.

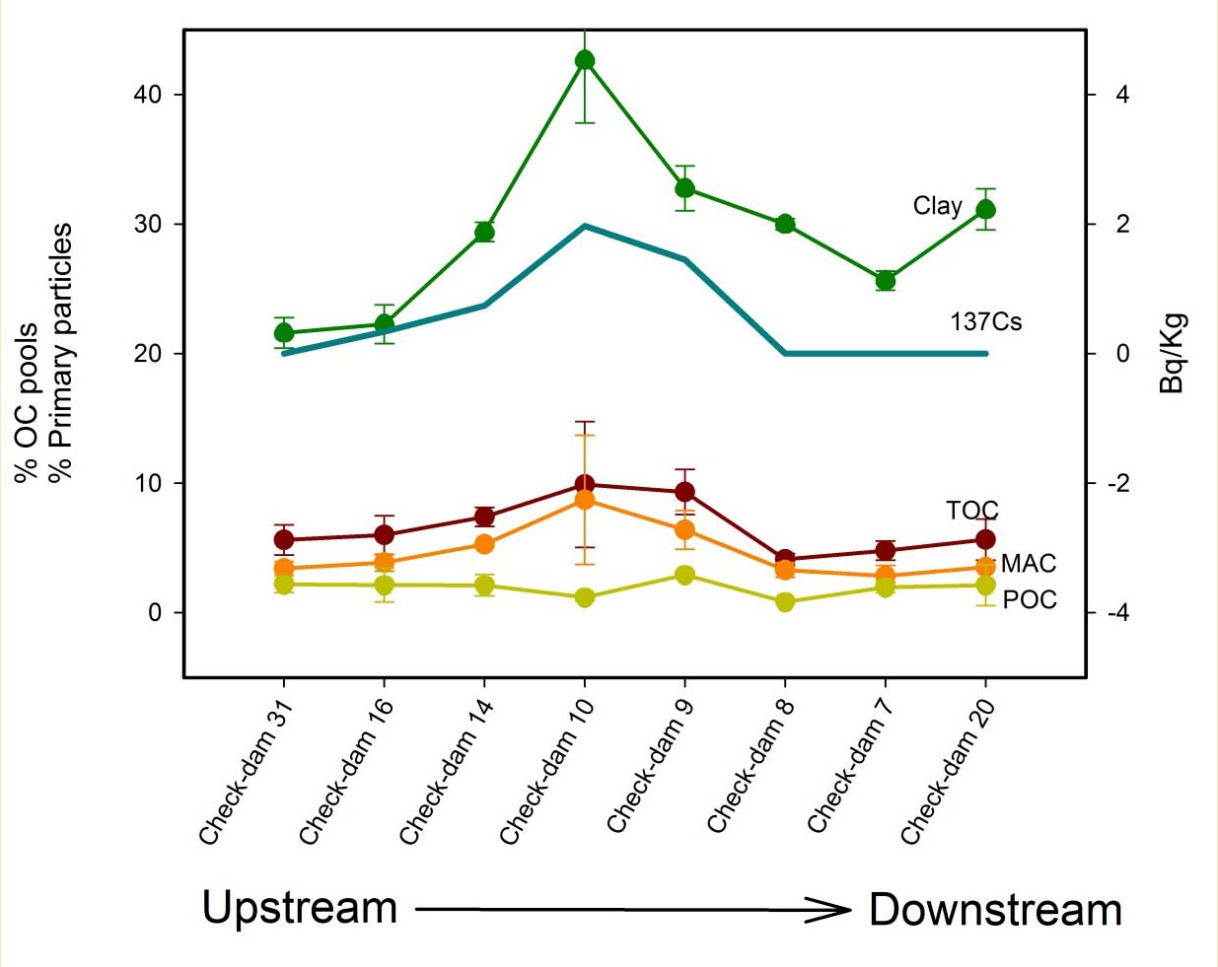
Nested: subcatchment, buffer channel



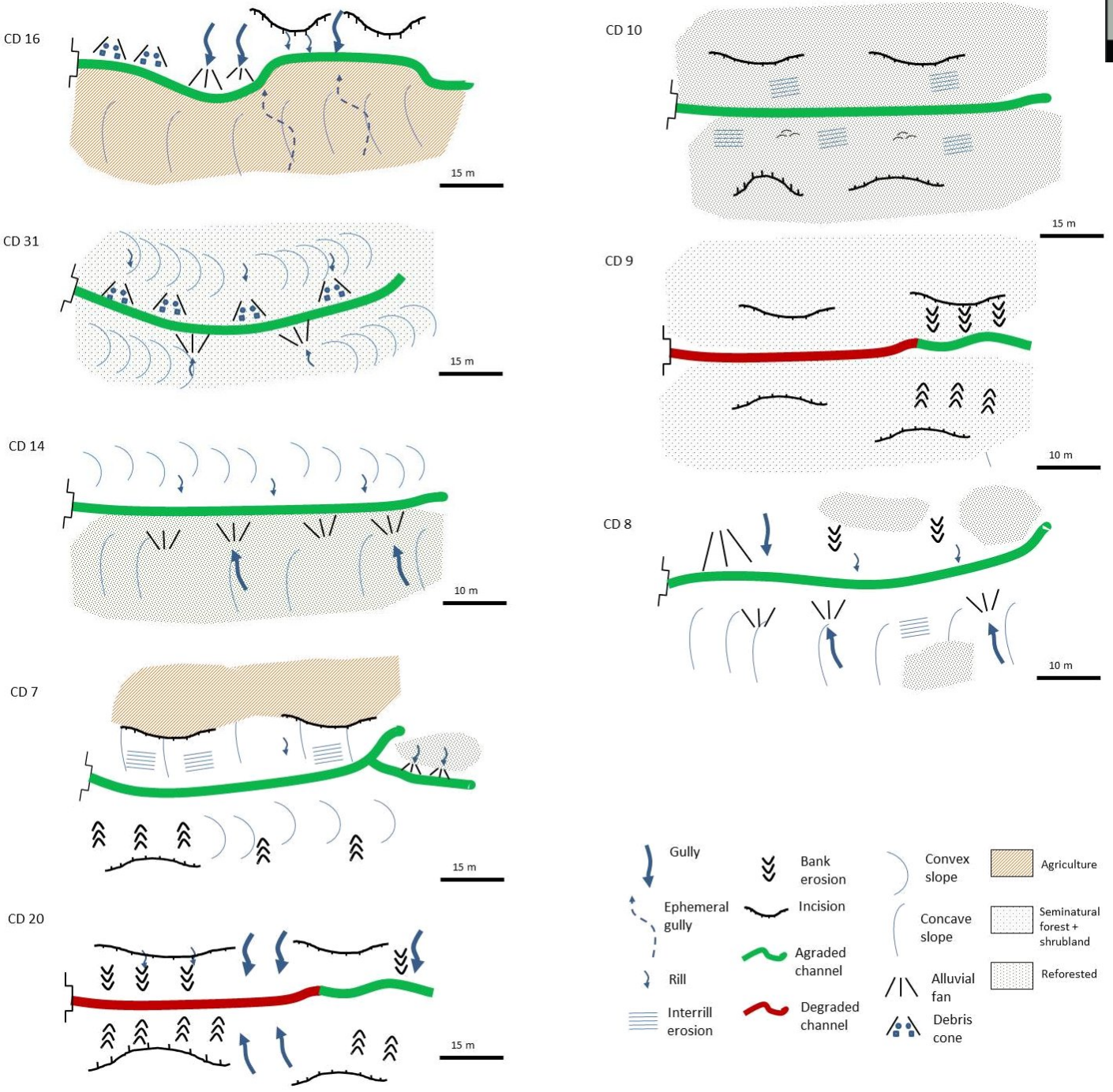


# Results

| | Clay | Silt | Sand | $^{137}Cs$ | TOC | C:N | POC | MAC |
|---|---|---|---|---|---|---|---|---|
| | % | % | % | Bq $kg^{-1}$ | g $kg^{-1}$ | | g $kg^{-1}$ | g $kg^{-1}$ |
| Forest soil | - | - | - | | 15.2±7.2 | 14.96±3.0 | 6.4±2.9 | 8.5±2.7 |
| Agricultural soil | 24.07±0.5 | 67.1±0.14 | 8.81±0.69 | 8.3±10.59 | 4.4±0.9 | - | - | - |
| Sediments | 29,54±1,7 | 59.52±2.2 | 10.93±3.9 | 0.59±0.68 | 6.6±0.7 | 9,90± 0,68 | 1.9±0.2 | 4.7±0.7 |

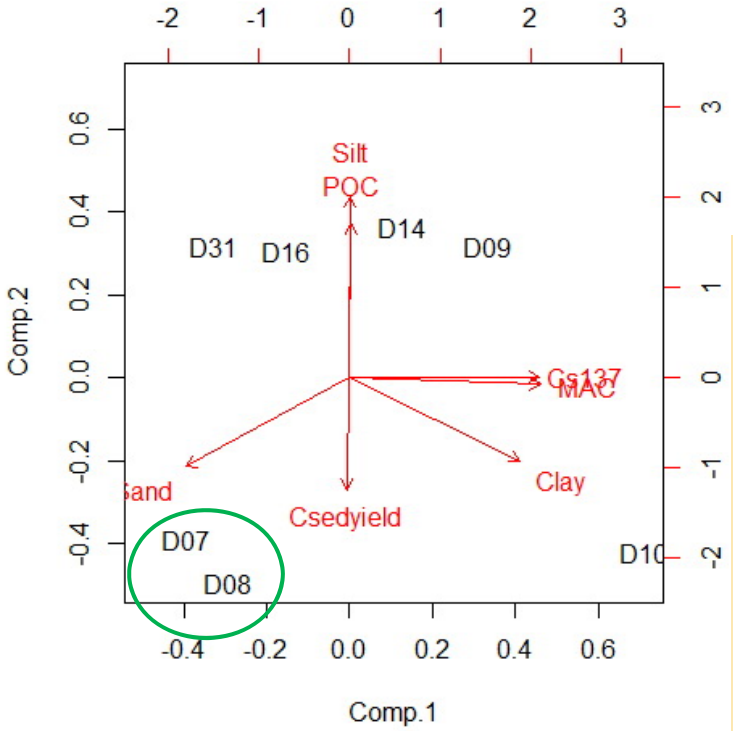


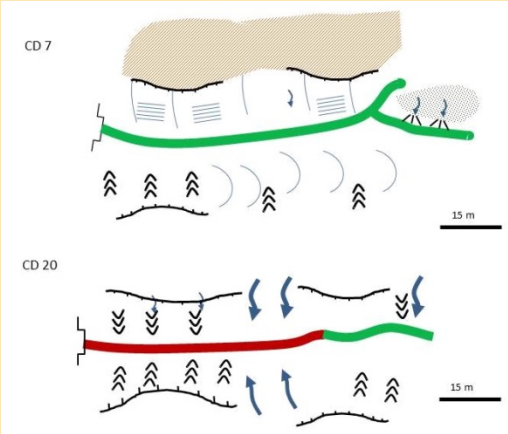
# Results

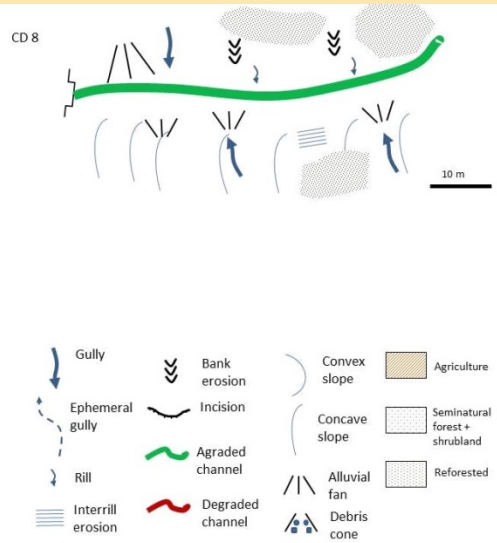


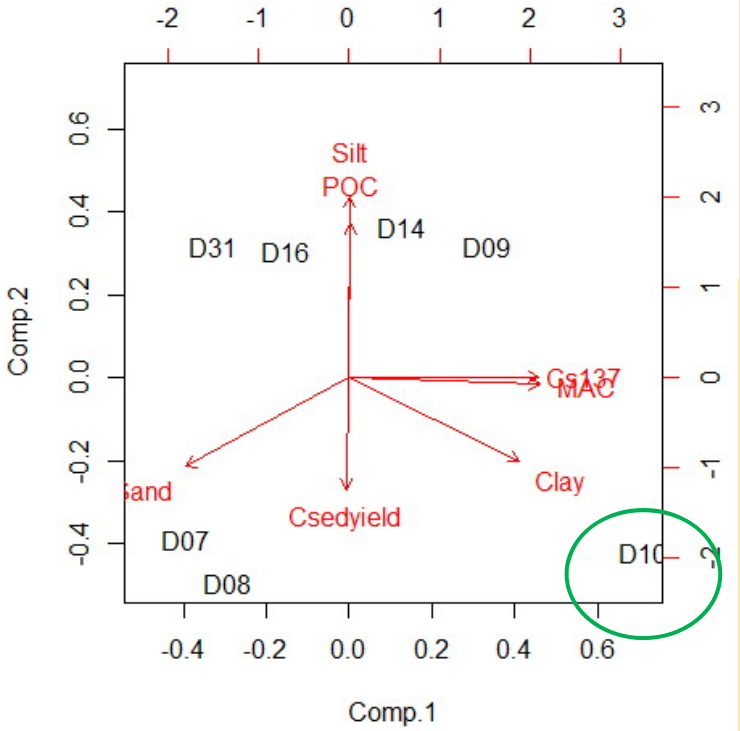
# Results

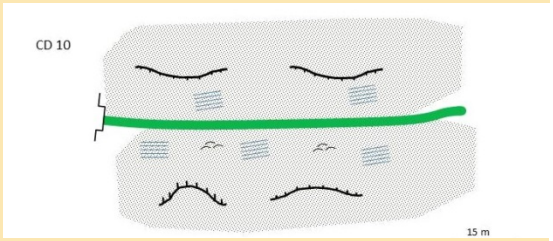
| | Check-dam | Sediment Yield Mg ha$^{-1}$ y$^{-1}$ | TOC erosion rate Mg ha$^{-1}$ y$^{-1}$ | Ratio TOC erosion/total soil erosion | POC erosion rate Mg ha$^{-1}$ y$^{-1}$ | MAC erosion rate Mg ha$^{-1}$ y$^{-1}$ | Ratio POC:MAC |
|---|---|---|---|---|---|---|---|
| Upstream | D16 | 3.59 | 0.018 | 0.005 | 0.0064 | 0.0117 | 0.55 |
| | D31 | 1.39 | 0.007 | 0.005 | 0.0027 | 0.0042 | 0.64 |
| | D14 | 3.44 | 0.023 | 0.006 | 0.0065 | 0.016 | 0.40 |
| | D10 | 6.78 | 0.056 | 0.008 | 0.0067 | 0.049 | 0.13 |
| | D9 | 0.85 | 0.007 | 0.008 | 0.0026 | 0.0049 | 0.46 |
| | D8 | 2.78 | 0.010 | 0.004 | 0.0024 | 0.0081 | 0.25 |
| Downstream | D7 | 23.03 | 0.097 | 0.004 | 0.0400 | 0.057 | 0.69 |
| | Average | 5.98±7.75 | 0.031±0.03 | 0.006±0.002 | 0.009±0.005 | 0.021±0.002 | 0.44±0.20 |

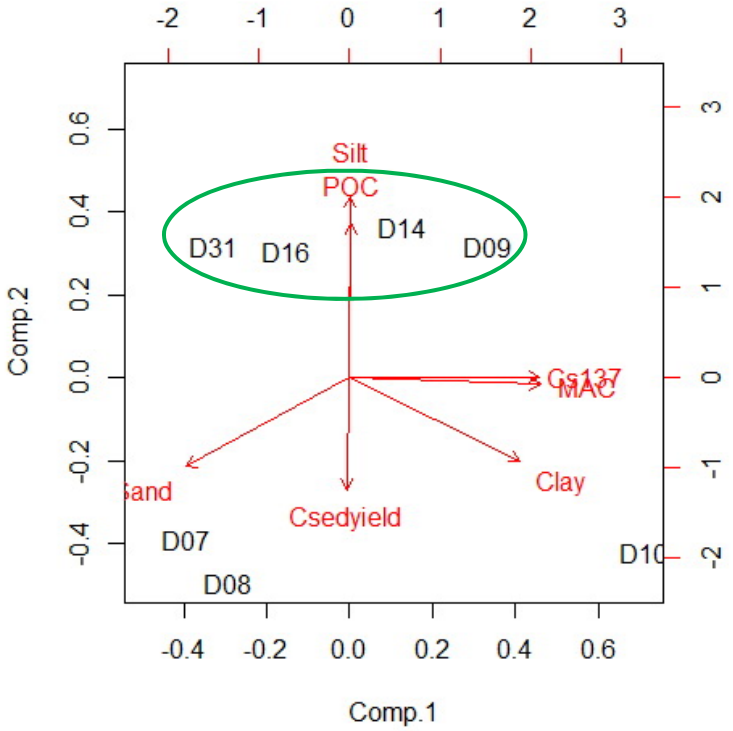

Silt
POC
D31
D16
D14
D09
Cs137
MAC
Clay
Sand
Csedyield
D07
D08
D10
Comp.1
Comp.2


CD 7
15 m
CD 20
15 m


CD 8
10 m
Gully
Ephemeral gully
Rill
Interrill erosion
Bank erosion
Incision
Agraded channel
Degraded channel
Convex slope
Concave slope
Alluvial fan
Debris cone
Agriculture
Seminatural forest + shrubland
Reforested


-2
-1
0
1
2
3
0.6
0.4
0.2
0.0
-0.2
-0.4
Comp.2
Silt
POC
D14
D31
D16
D09
Cs137
MAC
Clay
Sand
Csedyield
D07
D08
D10
-0.4
-0.2
0.0
0.2
0.4
0.6
Comp.1


CD 10
15 m


Silt
POC
D31
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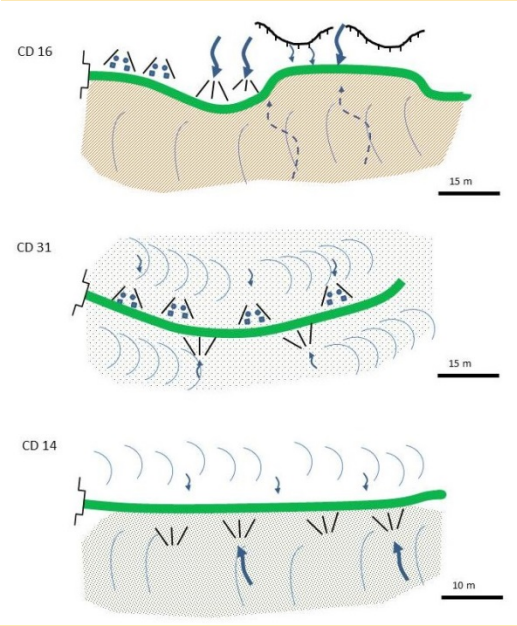
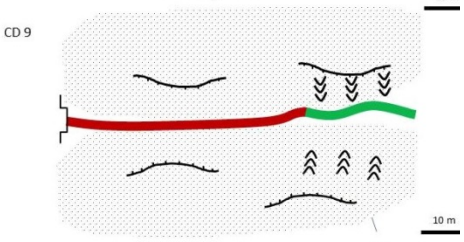
D10
Comp.1
Comp.2


CD 16
15 m
CD 31
15 m
CD 14
10 m


CD 9
10 m

| Predicted variable | Independent variables | Unstandardised partial regression coefficient ±Standard error | p-value | Multiple $R^2$ | Adjusted $R^2$ | F | p-value |
|---|---|---|---|---|---|---|---|
| TOC (%) | Intercept | 1.051±0.044 | <0.001 | | | | |
| | Geomorph_subcatch | -0.03±0.029 | 0.37 | | | | |
| | Litho_Soils_subcatch | -0.139±0.036 | 0.030 | 0.966 | 0.920 | 21.19 | 0.0154 |
| | Land_use_veget_subcatch | -0.070±0.031 | 0.111 | | | | |
| | Litho_Soil_subcatch | 0.272±0.034 | 0.004 | | | | |
| POC (%) | Intercept | 1.933±0.209 | 0.000 | | | | |
| | Litho_Soils_subcatch | 0.242±0.156 | 0.171 | 0.287 | 0.168 | 2.418 | 0.170 |
| MAC (%) | Intercept | 4.660±0.584 | 0.000 | | | | |
| | Litho_Soil_subcatch | 0.9117±0.436 | 0.080 | 0.424 | 0.328 | 4.42 | 0.080 |

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11 % of C stock lost by erosion in 21 years, 0,52 % per year

# Conclusions

- Sediments poor in OC compared to the soils of the catchment area.
- Sources: deeper sediments mobilized by concentrated erosion processes; others from vegetated (reforested) areas close and well connected to the channel.
- Lithology, soils and geomorphology control organic carbon redistribution in this catchment with fragile environmental c onditions, more than land use and vegetation cover.
- The loss of OC by erosion is relevant in an area with a potential low replacement, it is key to understand if this OC is stabilized in depositional areas.


Thank you!
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