Comparing different approaches to measure erosion by concentrated flow in a rainfed agroecosystem in SE Spain: Field inventory vs RPAS

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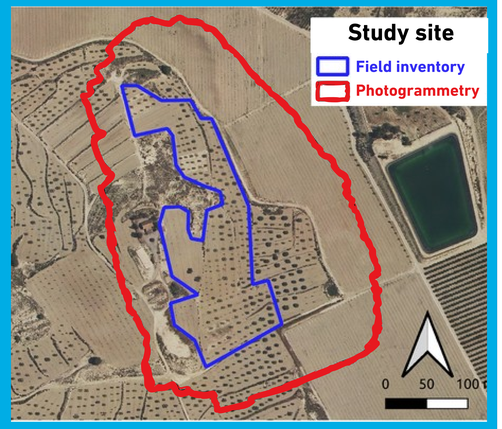
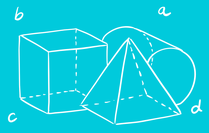
Introduction

Concentrated-flow erosion is one of the main drivers of soil loss in Mediterranean agroecosystems with soft lithologies and it can produce a wide range of negative off site effects.

We studied concentrated-flow erosion in a rainfed mediterranean agroecosystem in South East Spain through two methodologies: **field inventory** over **2,62 ha** and **photogrametry by RPAS** (**Remotely Piloted Aircraft**) over **12,9 ha**. The **main goal** of this experiment is to **identify**, with both methods, **forms of concentrated erosion**, to **describe them** and **quantify volume** of mobilised material and the **associated erosion rates**.



Methodology



1 **Field inventory**

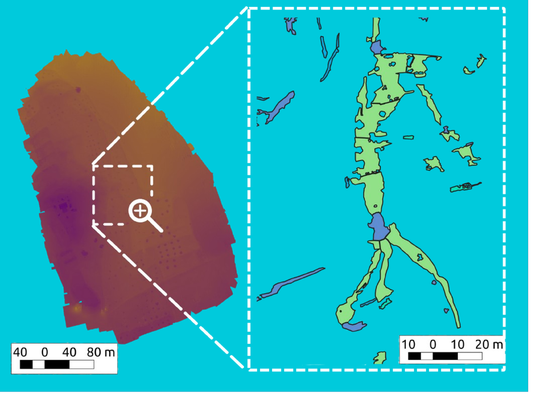
- A **measuring tape** to **divide longitudinally** and **fit to a geometrical shape** each morphology.
- Measuring of **width**, **length** and **depth** of each division to **estimate volume**.

VS

2 **Photogrammetry by RPAS**

- With **DJI Mavic Pro**.
- **RPAS aerial images** + **digital elevation models** (DEMs), for **identification of morpholgies**.
- **Resolutions of DEMs** and **height variations to estimate volume**.

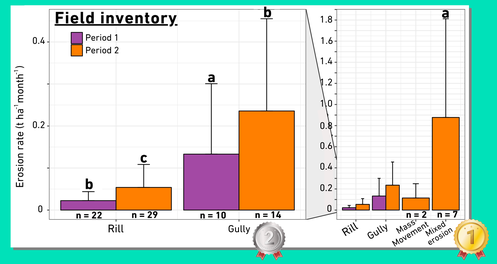
- **45 bulk density soil samples** (surface, 45, 90 and 135 cm), to **transform volume to mass.**
- Then, **calculate differences** between:
  - Second - first inventory or flight = **period 1 (november 2018 - december 2018).**
  - Third - second inventory or flight = **period 2 (december 2018 - october 2019).**
- Time passed + sampled area = **Erosion rate of morphologies**.

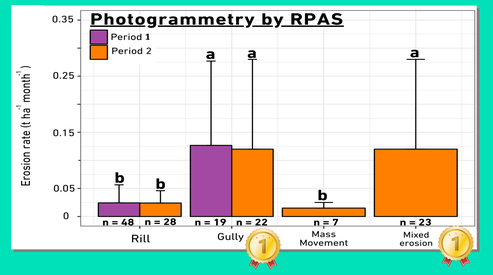


Results

Morphologies identified

Median erosion rate per erosive morphology





- **Erosion budget** at the estudy areas, including **all the erosive morphologies**, showed rates of **0,45** and **14,78** t ha^{-1} month^{-1} with **field inventory** and **14,27** and **10,39** t ha^{-1} month^{-1} with **photogrammetry**, in **period 1** and **2 respectively**.
- **69, 16, 50 and 100 %** of the **rills, gullies, mass movements and mixed erosion**, **respectively**, identified **with field inventory** were also identified **with RPAS**.
- Those **morphologies** identified with both methods showed a **higher value of RPAS erosion rate estimation** (40 - 50 %) than **field inventory**.

Conclusions

- The **mixed form** of erosion and the **gullies** showed a **high erosive potential**, involving a **great environmental threat** on this kind of agroecosystems.
- At a relatively low cost, **RPAS**, through its greater resolution, can help to **get more reliable values of concentrated erosion rates** in rainfed agroecosystems than **field inventories**.

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