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Perception of local stakeholders and biophysical assessment of water erosion control in a Tunisian semi-arid catchment

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Sol - Agrosystème - Hydrosystème

A short presentation

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Contour benches in Sbahia watershed, northern Tunisia © Samar Amri 2022



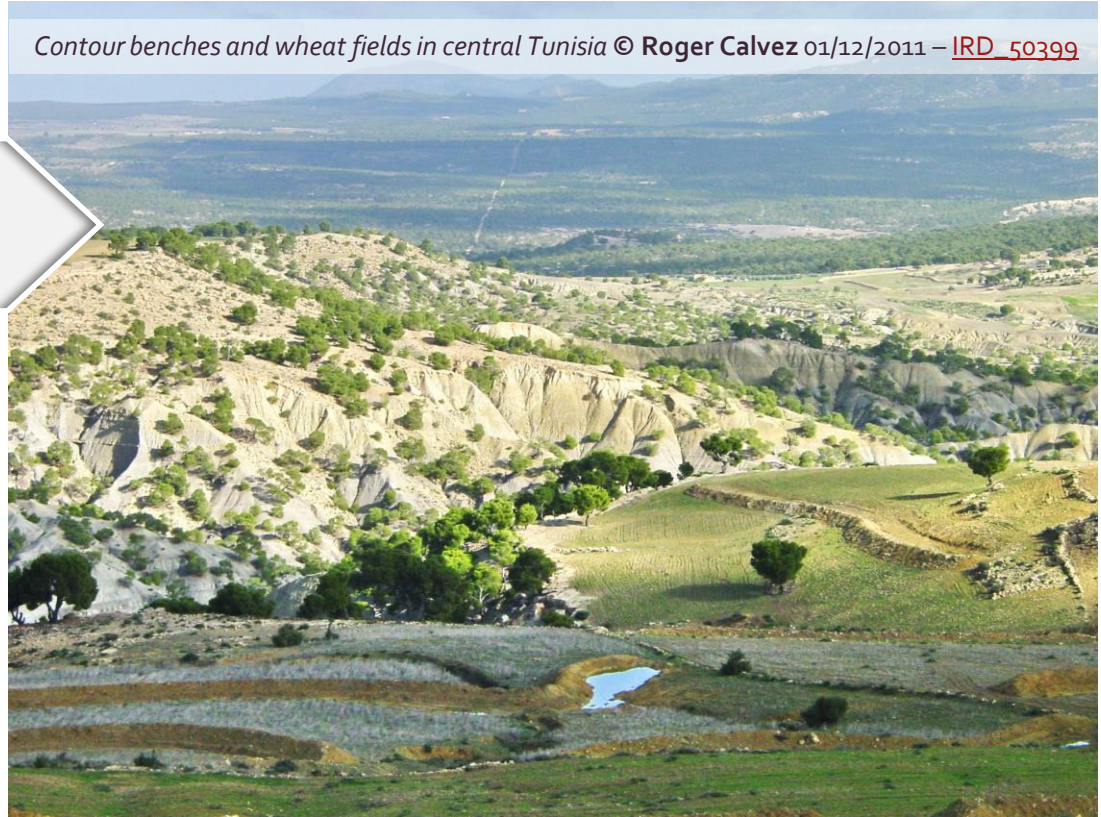
Context and challenges

Mediterranean region is naturally vulnerable to **erosion**, exacerbated by long anthropic pressure (García-Ruiz et al., 2013)

Local societies try to **control** water erosion processes with varying degrees of success (Raclot et al., 2016). Reasons behind poor performances remain unclear

Soil and water conservation measures have been studied either from a **biophysical assessment** perspective (Baccari et al., 2008; Fourati et al., 2015) or focusing on **socio-economic** aspects (Dangiso and Wolka, 2023; Gennai-Schott et al., 2020). Only a few studies have considered **both perspectives** (Fehri, 2003)

Contour benches and wheat fields in central Tunisia © Roger Calvez 01/12/2011 – [IRD_50399](#)



Aim of the study

Evaluating the performance of the water erosion control system by **comparing** biophysical assessment of the soil and water conservation measures with local stakeholders' perception of their (dys)functioning.

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In Tunisia more than half of agricultural land area is affected by water erosion.

Contour benches are the most soil and water conservation measure widespread on hillslopes (Fehri, 2003)



Contour benches in Sbahia watershed, northern Tunisia © Samar Amri 2022

Study area

A hilly and semi-arid environment typical of the southern Mediterranean region.

Sbaihia small rural catchment
Zaghouan, NE Tunisia.

357 ha, > 50% is agricultural land belonging to a single farmer and no residential buildings

Hilly lake built in 1993 with an initial capacity of 135000 m³

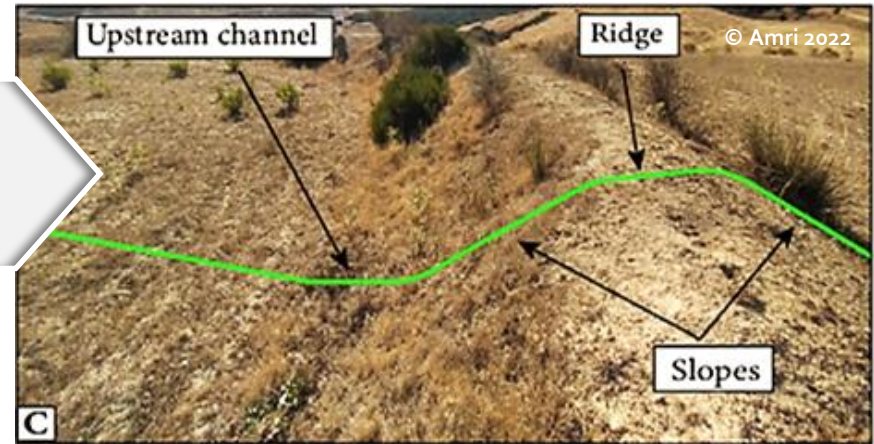
Water erosion still acting

Mechanical contour benches with total water retention cover 42% of the total area (2022), the majority of which were installed in 1981-1982, then around 1990.

It belongs to the *Imada* of Oued Sbaihia, where 2000 inhabitants reside in the form of 9 *Douars* (small dwelling nodes, Ounalli et al. 2021).



Sources : Google Earth (2021) and World Imagery – Amri 2022



Methodology

Biophysical assessment

1 – Mapping of erosion issues and degradation of contour benches

2 – Field survey to document shape, continuity and (dys)functions of contour benches

dysfunctions : local anomalies of contour bench geometry, misuse

Local stakeholders survey

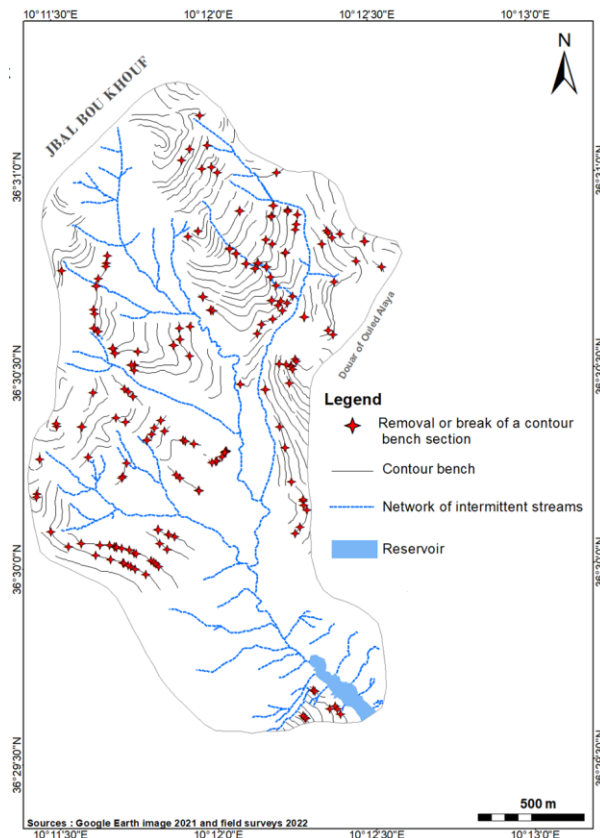
- management activities of soil and structures
- perception of soil erosion and functional state of contour benches
- (role and degradation of the forest)

Results – biophysical assessment /1 – mapping

Removal or break of a contour bench section

A partial or complete removal or break of a short section of the contour bench (both slopes and ridge), either in its central part or at one of its extremities.

This is the riskiest dysfunction because it promotes local overflow, stimulating water concentration and downstream gulying.



Results – biophysical assessment /2 – field survey

Disappearance or significant attenuation of the upstream channel

A partially or completely filled upstream channel
- limits the retention of runoff water
- leads to a high risk of ridge overflow.



Weakening of the contour bench slopes

Natural or anthropogenic ablation or excavation of the bench slopes may lead to local contour bench breaches.



It includes tunnels crossing the bench, leaving the ridge overhanging.

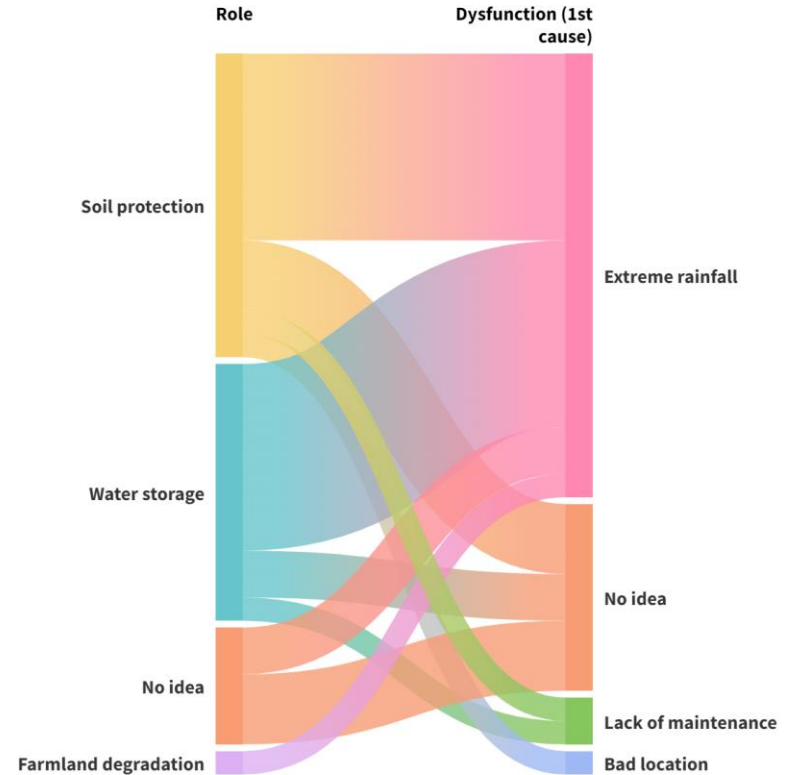


Results – stakeholders' perception (30 respondents)

Four types of **direct links** with the catchment area:

- **farmers** working in the catchment on a permanent or seasonal basis, including the only one owner of the catchment;
- **herders** conducting their livestock in the catchment;
- **water users** from the reservoir in the catchment outlet;
- **forest users** frequenting the area for the collection of wood, Aleppo pine nuts or aromatic plants.

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14 respondents declared being landowners in or near the study area. Half of them were also concerned by the construction of benches during the national implementation phases.



Comparison biophysical assessment / local perception

Master degree thesis by Amri, 2023

The discrepancy between the perception of local stakeholders and the biophysical evaluation of dysfunctions revealed two main misuses of the area managed by local actors

Lack of maintenance

- Gradual elimination of **upstream channel**
- Weakening of slopes due to **livestock trampling**

Modifications of contour bench system

- **Removal** of benches to increase cultivated area
- **Splitting** benches for machinery access
- **Improper** installation of new benches: poor awareness of the interaction between the sequence of contour benches



Take home messages

Anthropogenic factors amplify natural **erosion** processes, and the Mediterranean watershed are particularly exposed

Need for greater focus on **human factors** in erosion control and include them in biophysical oriented research

Importance of involving local stakeholders in **design and maintenance** of water erosion control structures

Participatory approaches are recommended for long-term success of soil and water conservation **programs**



Méditerranée Son Frontières - Sabine Rethoré - 2011 - Copyleft 3 <http://sabine-rethore.net/fr/carte/mediterraneesan.html>

Thank you for your attention



Contour benches and livestock breeding in the Sbaihia watershed, northern Tunisia © Samar Amri 2022

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