

Quantifying the environmental effects of pasture restoration through scrubland clearing combined with livestock management



Diana Pascual
Eduard Pla

Estela Nadal-Romero
Javier Zabalza Martínez
Teodoro Lasanta
Yolanda Pueyo

Ramón Reiné
Olivia Barrantes
Ana Foronda

Noemí Lana-Renault
Purificación Ruiz-Flaño
Jorge Lorenzo

LIFE MIDMACC promote **adaptation** through the implementation and testing of different **landscape management measures** to meet climate change related challenges in marginal mid-mountain areas of Spain, while improving their socioeconomic development.

Pasture recovery through scrubland clearing and introduction of extensive livestock farming



Optimization / Introduction of vineyards in mountain areas



Forest management for fire risk prevention and maintenance with extensive livestock farming



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Expected positive effects of pasture recuperation

1. More fragmented and heterogeneous mosaic landscape.
2. Increased biodiversity.
3. Increase in pastoral resources and livestock censuses. New farms emerge.



4. Decrease in the number of fires and the area burnt.
5. Increase in water resources and river flows.
6. Improvement of organic carbon storage in soils, especially in old clearings.

Implementation of **pasture recovery** practices in three pilot sites: 2 in La Rioja (Ajamil, San Román de Cameros) and 1 in Aragon (Garcipollera).

- Old pasture abandoned land and occupied by scrublands.
- Mechanical and manual **scrubland clearing** in winter 2019-2020.
- Introduction of livestock with different **management scenarios** (2020-2023).



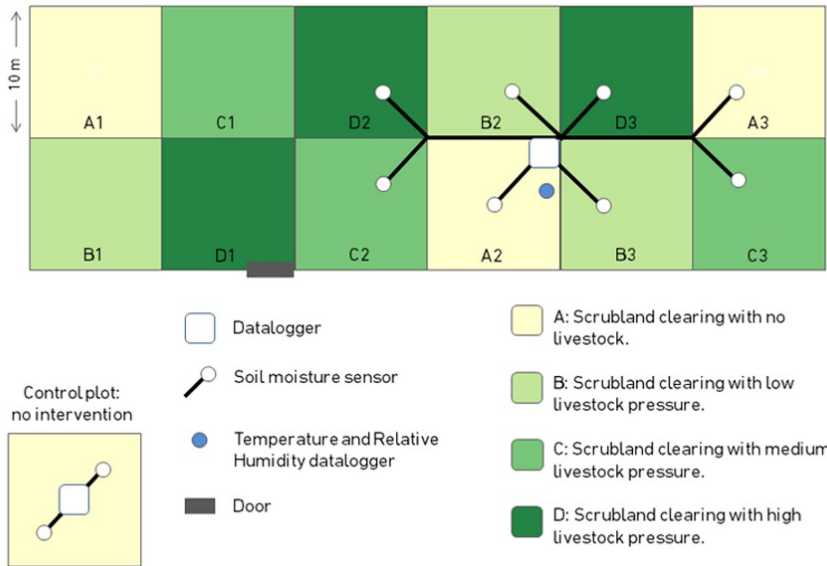
La Rioja



Aragon



Implementation of a **monitoring network** to test the environmental effects of scrubland clearing and livestock management:



Four livestock pressure scenarios with three replications in all sites (100 m² plots)

- SC with no livestock.
- SC with **low livestock pressure**. Four sheep, one time per year (spring), 72 hours.
- SC with **medium livestock pressure**. Four sheep, twice per year (spring and autumn), 72 hours.
- SC with **high livestock pressure**. Four sheep, three times per year (spring, end of summer and autumn), 72 hours.

Control



Monitoring ecological variables from 2020 to 2023:

- Some interesting trends, although with high variability depending on the sites.



Soils



Soil humidity



Infiltration-Erosion



Pasture
production and
quality



Pasture
biodiversity



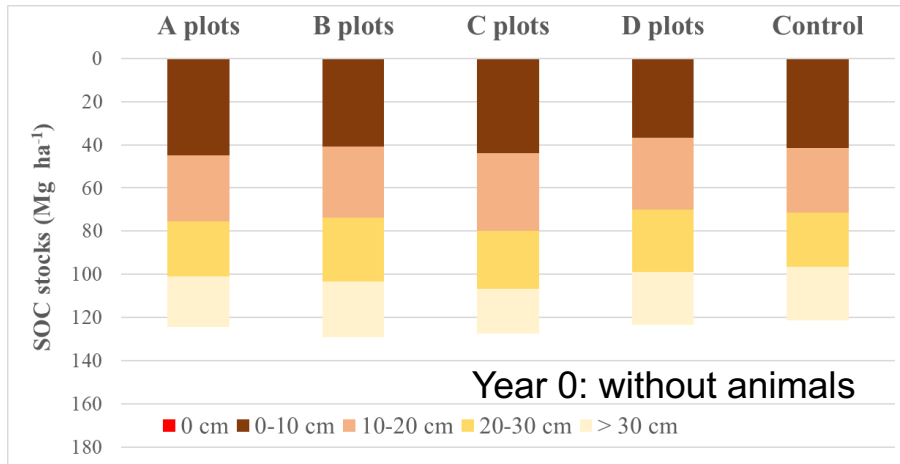
Temperature and
relative humidity



Precipitation

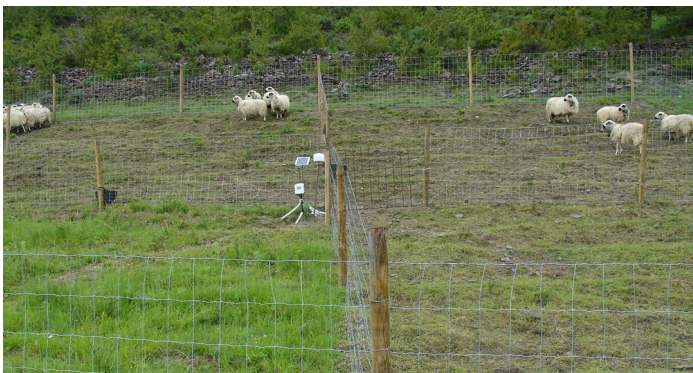


- **Soils:** Initial soil analysis and annual monitoring of organic carbon in the superficial soil (10 cm).
- First results: **Increase in organic carbon in the superficial soil** in the cleared subplots, with different intensities depending on the livestock load.



Aragon

SOC Mg ha ⁻¹ (10 cm)	YEAR 0	YEAR 1	Change %
A	44.0	41.7	-5%
B	40.6	46.6	+15%
C	43.7	53.2	+22%
D	36.5	41.9	+15%
Control	41.2	47.4	+15%

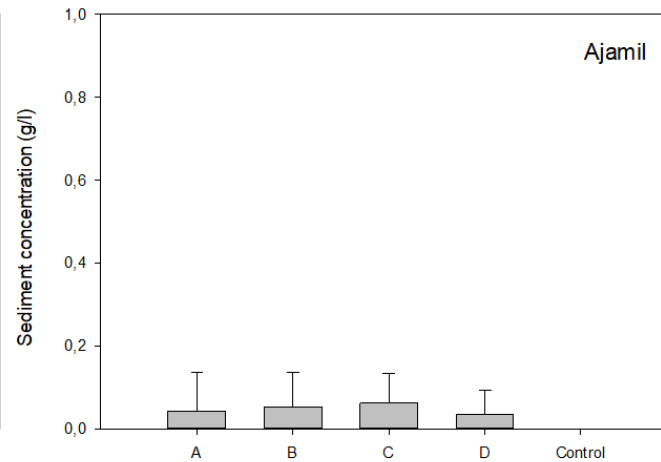
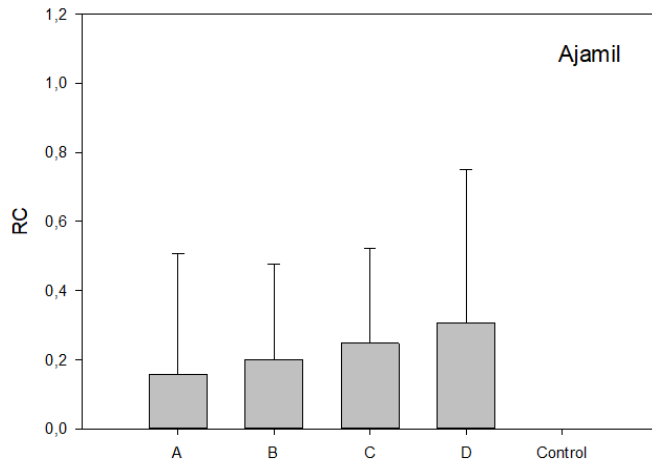


Corg/N ratio (10 cm)	YEAR 0	YEAR 1	Change %
A	12.08	21.39	+77%
B	11.30	16.22	+44%
C	11.70	17.00	+45%
D	11.27	17.51	+55%
Control	12.36	20.31	+64%



- **Infiltration and erosion:** Annual measure with a rainfall simulation device in winter, after livestock grazing.
- First results: **Higher responses in the cleared subplots** than in the control plots. Runoff generation increased with increasing level of grazing; however, in terms of soil erosion, the response was low and no clear differences were found between grazing intensities.

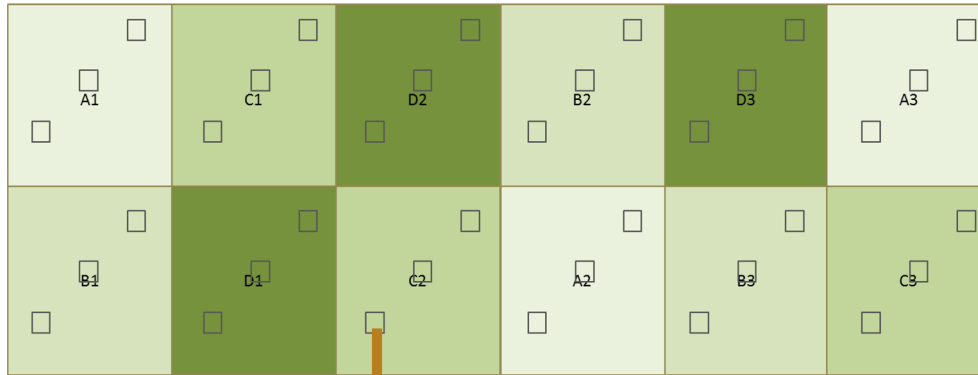
La Rioja



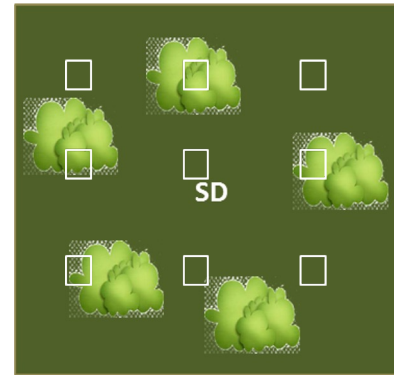


- **Pasture production, quality and biodiversity: Annual sampling in spring.**

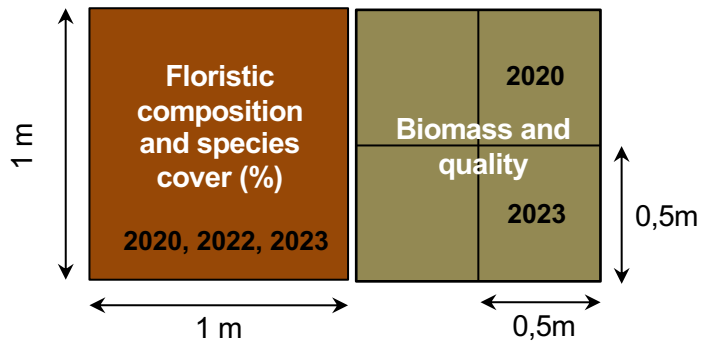
Cleared area



Control area



For each subplot:



Laboratory



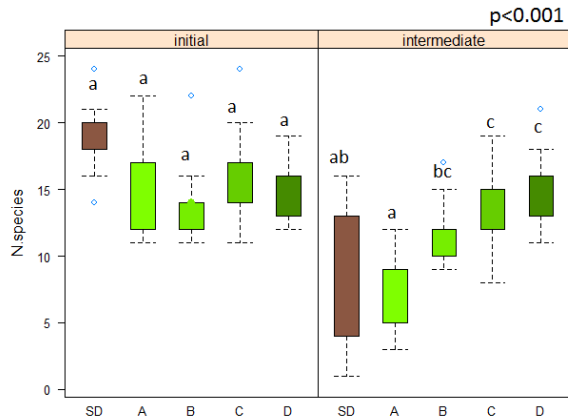


La Rioja

- **Pasture production, quality and biodiversity:** Annual sampling in spring.
- First results: **Positive effect** of the scrubland clearing on the herbaceous pasture (**biodiversity, production and quality**). An effect of the livestock load was also found in pasture **biodiversity**, being the low, medium or high the most beneficial depending on the site.

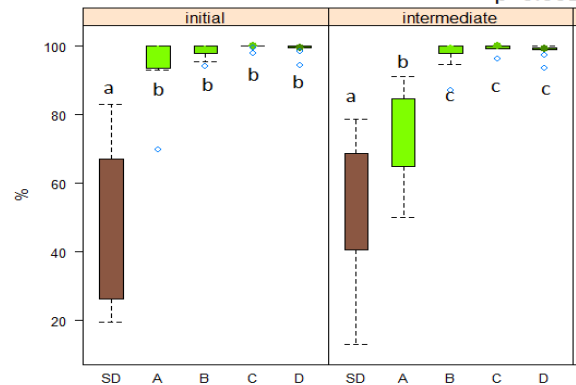
Biodiversity

Herbaceous species richness

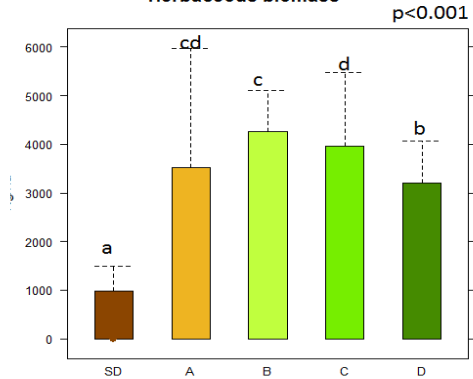


Production

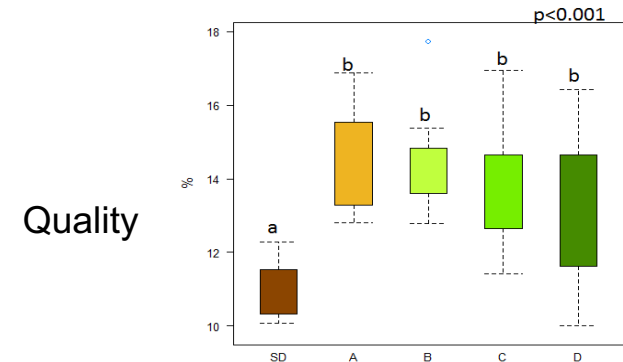
Herbaceous species cover



Herbaceous biomass



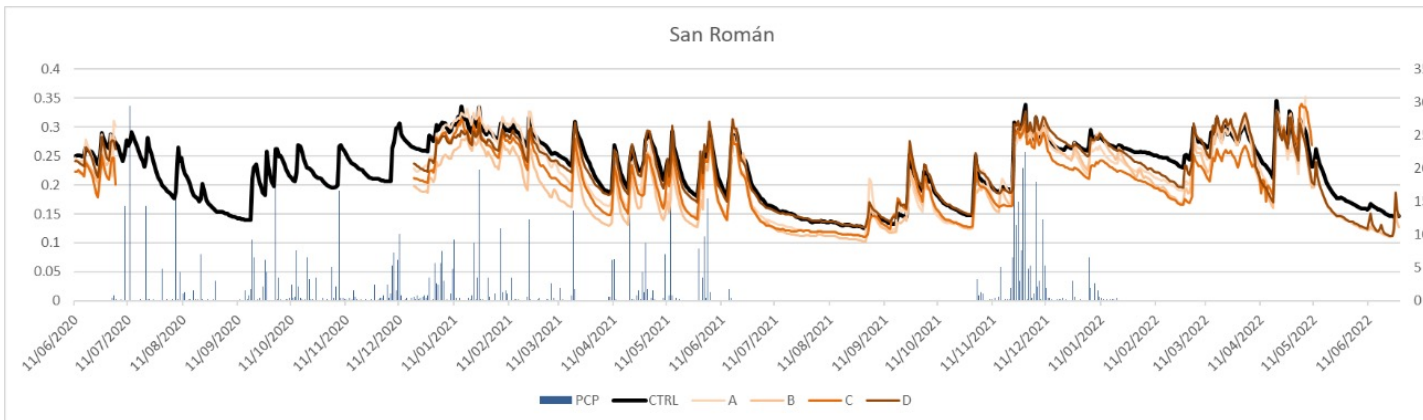
Crude protein



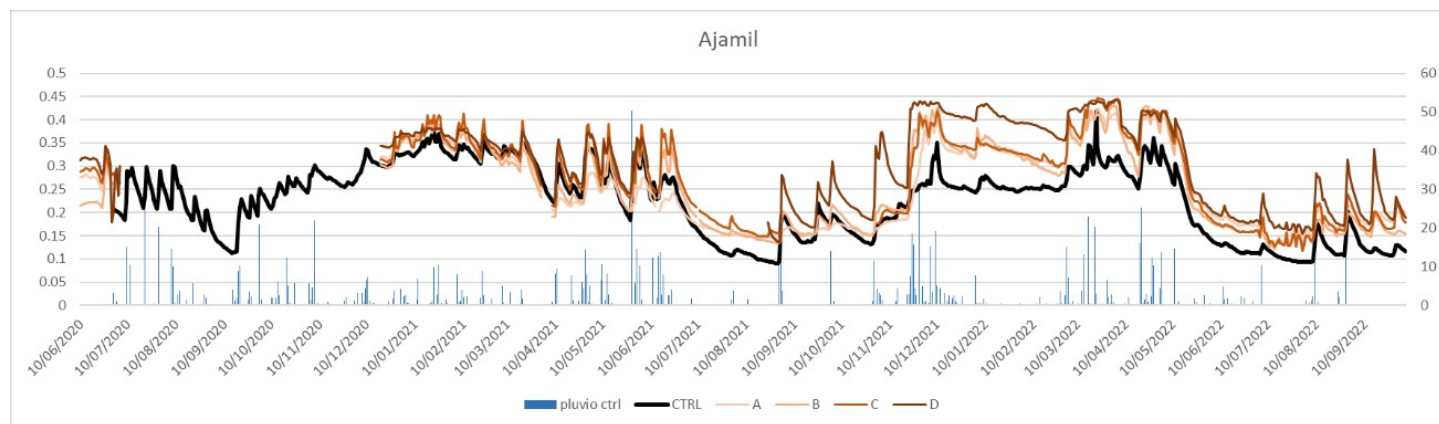
Quality



- **Soil humidity:** Dataloggers and soil sensors measuring in continuous since 06/2020.
- First results: **Significant differences** were related to soil moisture at annual and seasonal scale in the three sites.



La Rioja



Conclusions

The recovery of pastures can be key for the **adaptation of mountain areas to climate and global change**. In the experimental plots of LIFE MIDMACC, we have found:

- An **increase in organic carbon** in the superficial soil in the cleared subplots, with different intensities depending on the livestock load.
- A **positive effect** of the scrubland clearing on the herbaceous pasture (**biodiversity, production and quality**).
- An **effect of the livestock load in pasture biodiversity**, being the low, medium or high pressure load the most beneficial depending on the site.
- A **higher hydrological and sedimentological response** in the cleared subplots than in the control plots. An increase of runoff generation with increasing level of grazing, but not clear differences in terms of erosion
- No clear trends in soil humidity

Results provide managers with different **management practices** that can improve the **adaptive response to climate change** in areas with few socio-economic alternatives, due to their biophysical, historical and anthropogenic conditions.

THANK YOU VERY MUCH
FOR YOUR ATTENTION

www.life-midmacc.eu
info@life-midmacc.eu
[@midmacc](https://twitter.com/midmacc)

CREAF. Edifici C. Campus UAB
08193 Bellaterra (Barcelona). Spain
Tel: +34 93 581 46 75

COORDINATION



PARTICIPANTS

