Soil degradation in Argan Woodlands, South Morocco

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The argan woodlands have been heavily degraded due to overbrowsing and overgrazing by goats, sheep and camels as well as intensification and expansion of agriculture.

Canopy-covered areas decrease while areas without vegetation cover between the argan trees increase.

How do the areas under the tree and the mostly bare intertree areas differ in spite of their mutual degradation, especially concerning soil parameters and geomorphological processes?

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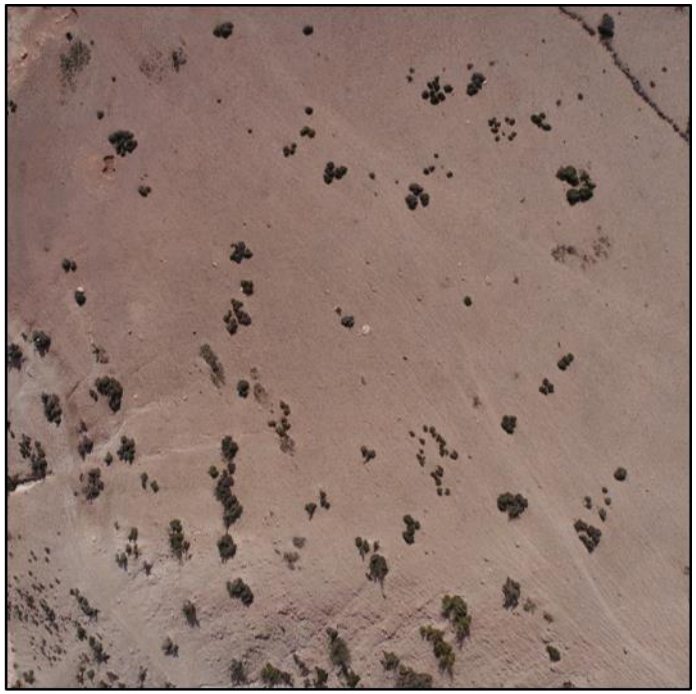
Decline in tree density (both images taken from 120 m height)



0 12.5 25 m

Degradation of tree architecture

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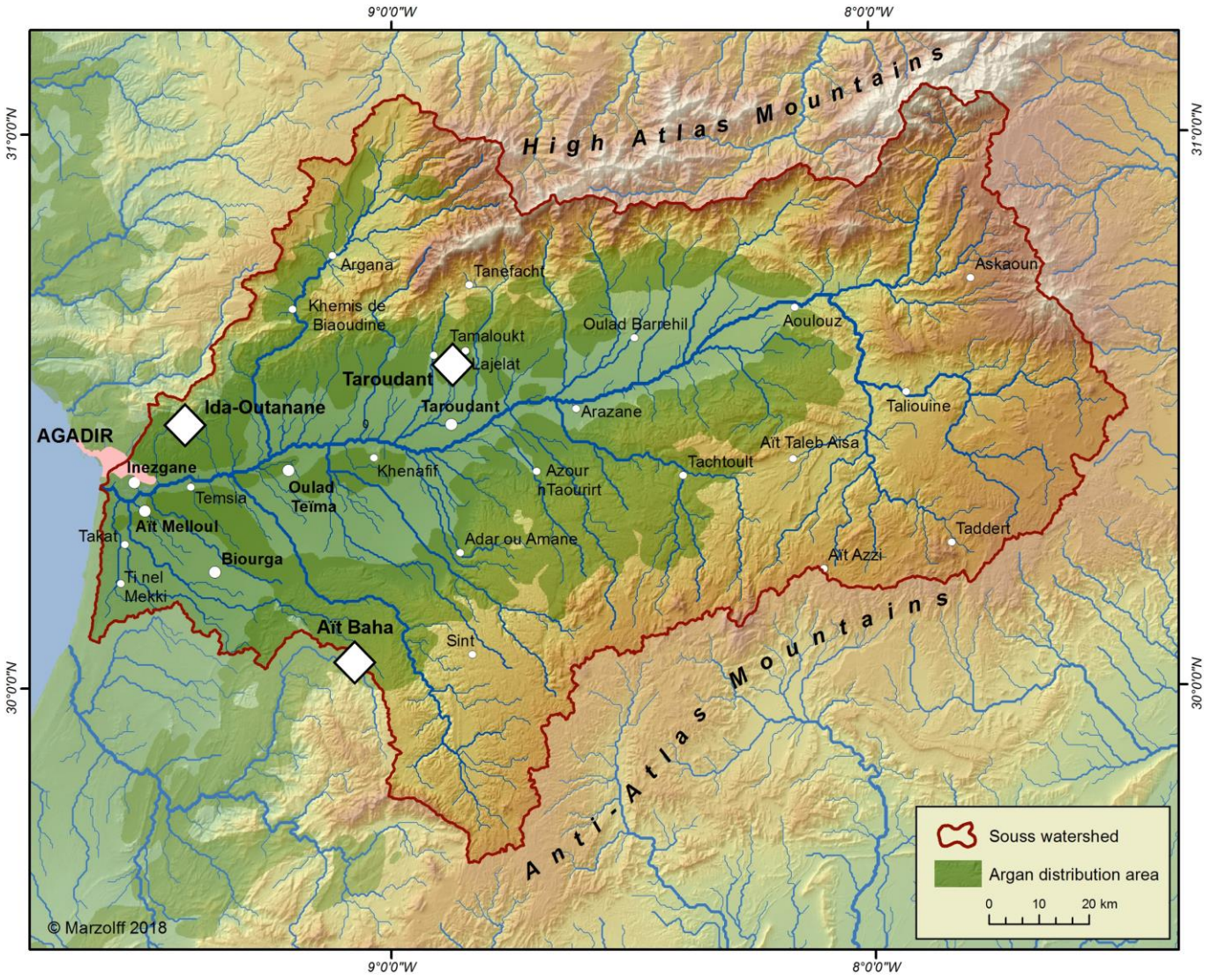
3 study areas in the Souss region



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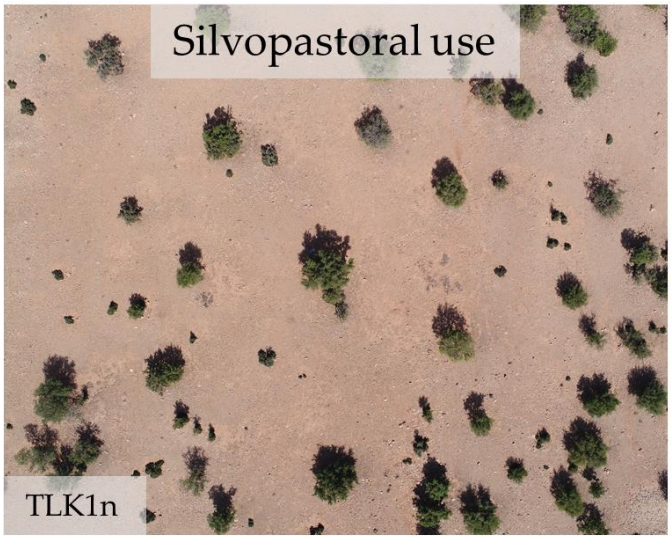
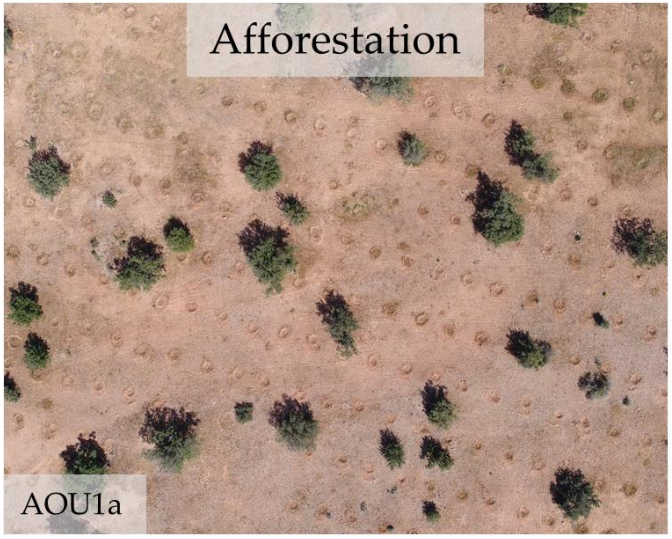
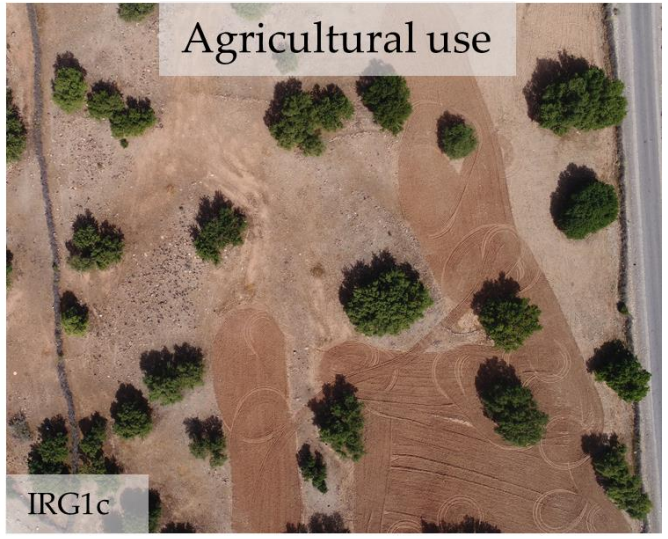
30 test sites with different attributes







0 25 50 m

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Methods used:

36 rainfall simulations to measure soil erodibility

18 for tree areas, 18 for corresponding intertree areas

60 infiltration measurements with a single-ring infiltrometer

30 for tree areas, 30 for corresponding intertree areas

60 soil samples analysed for pH, electrical conductivity, C_{total}, N_{total}, percolation stability, grain size distribution, cations

30 for tree areas, 30 for corresponding intertree areas

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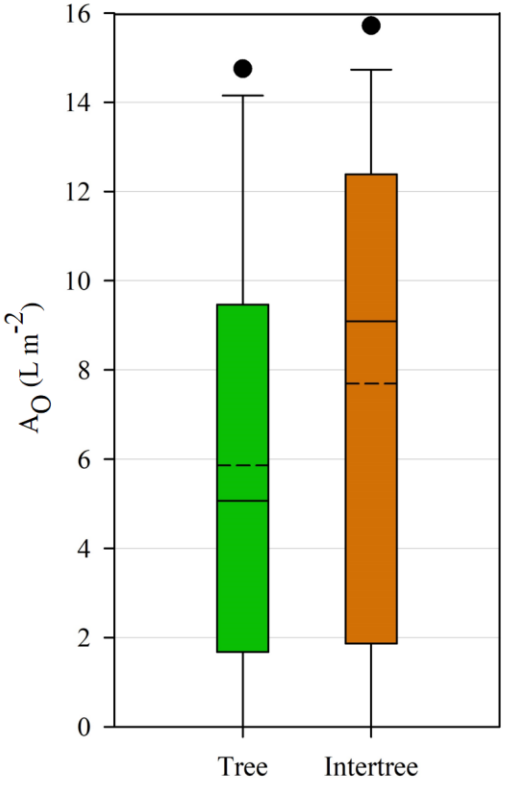
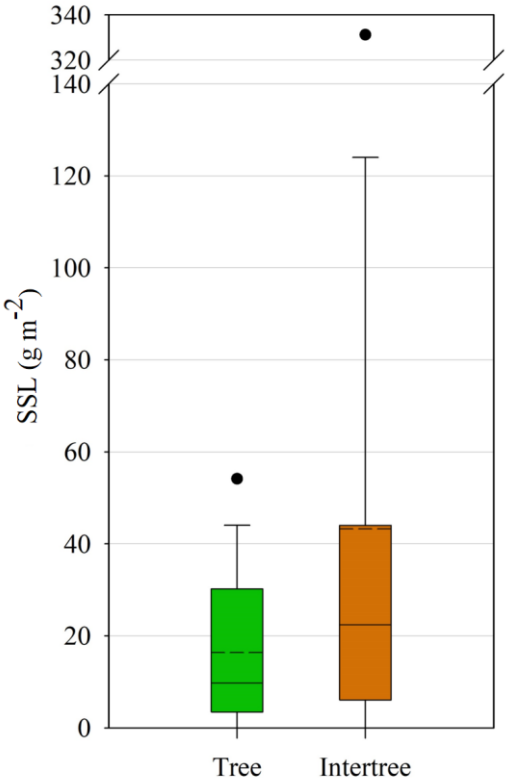
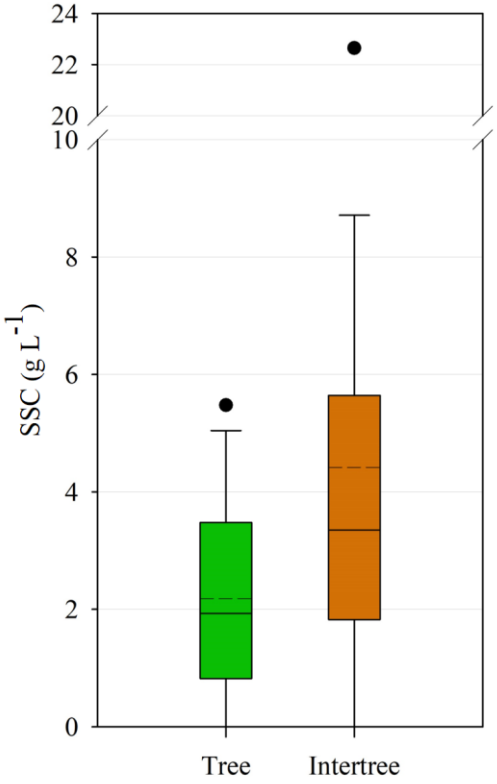


Surface runoff



Suspended sediment load



Suspended sediment concentration

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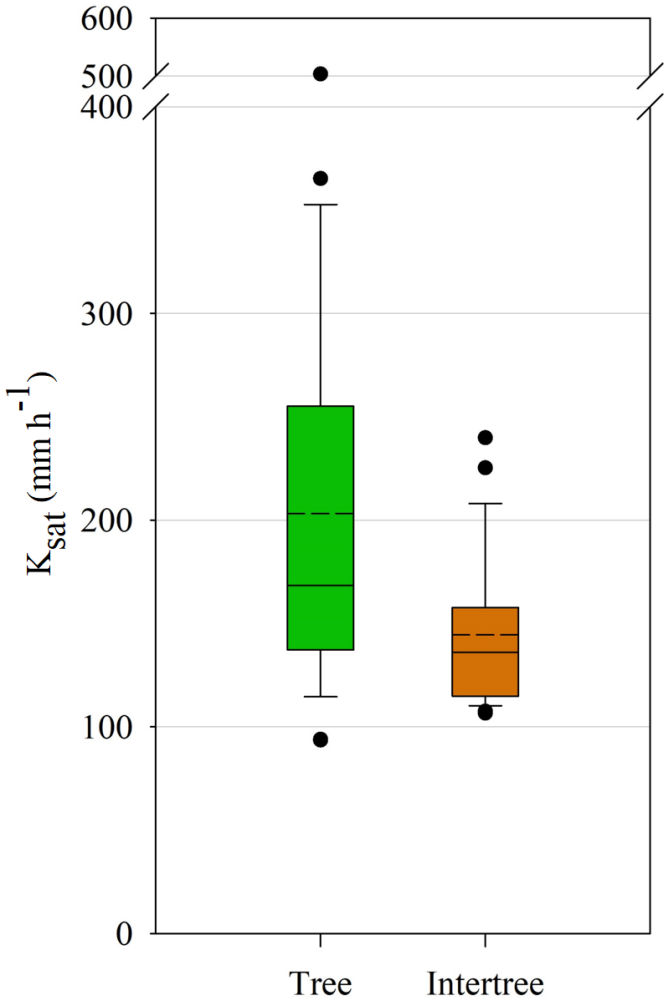

Saturated hydraulic conductivity

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Parameter	Tree	Intertree
Surface runoff (L m^{-2})	5.86	7.69
Suspended sediment load (g m^{-2})	16.35	43.25
Suspended sediment concentration (g L^{-1})	2.18	4.42
Saturated hydraulic conductivity (mm h^{-1})	**203.19**	**144.39**
pH	**7.41**	**7.32**
Electrical conductivity (µs)	**306.84**	**225.65**
C_{total} (%)	**4.79**	**1.77**
N_{total} (%)	**0.34**	**0.11**
Percolation stability (ml 10 min^{-1})	**183.69**	**43.23**
Mean grain size (mm)	0.22	0.18
K ($cmol_c$ kg^{-1})	**5.40**	**4.36**
Na ($cmol_c$ kg^{-1})	**1.12**	**0.76**
Mg ($cmol_c$ kg^{-1})	**6.03**	**5.07**
Ca ($cmol_c$ kg^{-1})	38.75	36.83

Means of the studied parameters.
Significant differences ($p<0.05$) between tree and intertree areas are displayed in grey and bold.

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Most of the studied parameters show significant differences between tree and intertree areas, even under various usages and in different study areas.

With a further decline in tree density and thus an expanding intertree area, the soils in the argan woodlands are threatened by further degradation.