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Spatial patterns of argan-tree influence on soil quality of intertree areas in open woodlands in South Morocco

Mario Kirchhoff¹, Tobias Romes¹, Irene Marzolff², Manuel Seeger¹, Ali Ait Hssaine³, and Johannes B. Ries¹

¹Trier University, Department of Physical Geography, Trier, Germany (kirchhoff@uni-trier.de)

²Goethe University Frankfurt am Main, Department of Physical Geography, Frankfurt am Main, Germany

³Université Ibn Zohr, Department of Geography, Agadir, Morocco

The endemic argan tree (*Argania spinosa*) in Morocco, which is the source of the valuable argan oil, forms open-canopy forests that are highly degraded due to overgrazing, illegal cutting of firewood and the expanding intensive agriculture. Because of the high grazing pressure young sprouts cannot establish themselves, reforestation measures are often unsuccessful and the bare areas between the isolated trees are expanding. In a previous study, we could already show that these intertree areas are more degraded than the areas under the trees, regarding various soil parameters as well as their erodibility and infiltration capacity.

The spatial extent of argan trees on soil quality from the trunk to the intertree area is so far unknown. Hypothetically, the tree influences the soil of the intertree area by wind drift of tree litter and soil material towards the East, i.e. main wind direction, and downhill by runoff and erosion processes of soil material downslope. Tree shadow in the hot midday and afternoon sun should have positive influences on soil moisture in northern or northeastern directions. To test this hypothesis, we took 424 soil samples around 31 argan trees in four directions, uphill, downhill and in both directions parallel to the slope towards the nearest neighbouring tree in that direction. Samples along these transects were taken near the trunk, just inside and just outside the area covered by the tree crown and in the intertree area in the middle between two trees. The soil samples were analysed for various soil parameters (C/N, percolation stability, electrical conductivity, pH, soil moisture).

The first results show that the influence of the trees is not limited to the crown-covered area but for some trees extends further into the intertree area in specific directions according to the hypothesis (East due to wind drift, North due to shade and downslope due to slope runoff). For other trees the influence of the trees does not even encompass the whole crown-covered area, where we found similarly lower soil quality as for the bare intertree areas. These differences may result from the degradation state of the tree as well as from the different characteristics of the study areas. Understanding the way argan trees influence their surrounding intertree areas would enable structured reforestation measures with a higher chance of successful rejuvenation of the argan forest.

