



Dune rehabilitation using a mechanical fixation technique: effect on sediment fluxes and on the quantitative and qualitative recovery of the herbaceous groundcover.

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Since the late 1980's, the south-east of Niger has benefited from several development projects directed at dune fixation. As a first step, these techniques rely on mechanical fixation using wind barriers to stabilize the dune, after which shrub species are planted. The growth of these shrubs is generally slow due to low soil fertility and the mechanical barriers have a limited life span. Hence the spontaneous recovery of the herbaceous ground cover could adequately supplement the wind barriers and planted shrubs in reducing sediment fluxes, especially during the first years of dune fixation when shrub cover is low. Little is known, however, about the effectiveness of wind barriers at promoting the recovery of the grass cover in terms of total biomass and biodiversity. The objective of this study was therefore to evaluate the effectiveness of a mechanical windbreak on eolian sediment flows and the recovery of the natural herbaceous cover. Palisades of *Leptadenia pyrotechnica* were planted according to a regular 20 x 10 m grid, covering a total area of 200 x 20 m on a mobile dune in the area of Gouré, South-Eastern Niger (300 mm annual rainfall). Measurements of sediment flow were taken during the Harmattan period (December-March) in 2005, 2006 and 2007 using Modified Wilson and Cooke sand catchers aligned along 8 transects parallel to the Harmattan winds. On each transect, a MWAC was placed at 3 m upwind and 2 m, 5 m, 9 m and 18 m downwind from the first palisade. Sediment fluxes were measured at 5 heights between 0.05 and 1 m above ground. A spatiotemporal monitoring was carried out in order to evaluate the qualitative and quantitative recovery of the herbaceous cover.

Most of the sediment fluxes occurred between mid-February and mid-March each year. In the first year (2005), sediment fluxes downwind of the first palisade were reduced by more than 98 % compared to the fluxes observed 3 m upwind. In 2006 and 2007 the effectiveness was nearly 100 % as a result of the recovery of the herbaceous cover. In its immediate surroundings, the windbreak induced large sediment deposits, which were enriched in coarse particles upwind and in fine particles, organic carbon and total N downwind of the barrier. Available P content remained very low. The restoration of the herbaceous cover was evidenced by the presence, at the end of the rainy season, of 13 species in 2005, 29 species in 2006 and 59 species in 2007, belonging, respectively, to 8, 18 and 20 families. The specificity index increased from 3.6 in 2005 to 6.8 in 2007 and the dominant species were *Aristida adscensionis* and *Cenchrus biflorus*. The dry herbaceous biomass behind the windbreak exceeded 200 g/m². These results demonstrate that wind barriers can lead to rapid recovery of the herbaceous cover both in quantity and biological diversity, on the condition that it be protected from grazing.