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The combined effect of land use and vegetation cover on potential dust emission in the Sahel

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Dust from the Sahel is important globally, and plays an important regional role in atmosphere and marine environments. Dust emission also has an important impact on soil fertility in the region, with annual dust emission able to remove the same amount of nutrients from soils as utilized by crops. Vegetation cover is one of the most important and dynamic surface controls on dust emission. It is affected by land use. In the Sahel, drier areas are mostly steppe used for grazing if they support any vegetation (the farthest north does not support vegetation). Above ∼300 mm mean annual precipitation, dryland agriculture is possible, with millet being an important crop. Fallowing is an important component of land management, resulting in a mosaic of active and fallowed fields in a dynamic agricultural landscape. Modeling studies have already shown that different land uses (active field vs. fallow or steppe) can have important impacts on timing and amount of aeolian flux. Remoteness and political strife make extensive field studies difficult, but remote sensing does have the potential to shed some light on the effect of agricultural practices on dust emission potential. Here, we use remote sensing to quantify surface soil cover and determine its dynamic effects on dust uplift potential. We have found that cropping results in a delay in greening compared to fallow/rangeland areas that, combined with clearing associated with agriculture, results in a significant increase in dust uplift potential in the region. Greater soil exposure even in cropped areas also has the potential to increase dust emission. Thus, we conclude that agricultural activities in the Sahel likely have a significant impact on dust emission from the Sahel, indicating peoples' major role in modulating dust emission in Africa.