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# Nutrient cycling and Above- and Below-ground Interactions in a Runoff Agroforestry System Applied with Composted Tree Trimmings

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The primary production in arid zones is limited due to shortage of water and nutrients. Conveying flood water and storing it in plots surrounded by embankments allows their cropping. The efficient exploitation of the stored water can be achieved through an agroforestry system, in which two crops are grown simultaneously: annual crops with a shallow root system and trees with a deeper root system. We posit that the long-term productivity of this system can be maintained by intercropping symbiotic N fixing shrubs with annual crops, and applying the pruned and composted shrub leaves to the soil, thus ensuring an adequate nitrogen level (a limiting factor in drylands) in the soil. To test our hypothesis we carried a two year trial in which fast-growing acacia (A. saligna) trees were the woody component and maize (Zea mays L.) the intercrop. Ten treatments were applied over two maize growth seasons to examine the below- and above-ground effects of tree pruning, compost application and interactions.
The addition of compost in the first growth season led to an increase of the soil organic matter reservoir, which was the main N source for the maize during the following growth season. In the second growth season the maize yield was significantly higher in the plots to which compost was applied. Pruning the tree's canopies changed the trees spatial and temporal root development, allowing the annual crop to develop between the trees. The roots of pruned trees intercropped with maize penetrated deeper in the soil. The intercropping of maize within pruned trees and implementing compost resulted in a higher water use efficiency of the water stored in the soil when compared to the not composted and monoculture treatments.
The results presented suggest that the approach used in this study can be the basis for achieving sustainable agricultural production under arid conditions.