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## Agroecological approaches in the dryland agroforestry systems of West African Sahel

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### Abstract

The application of agroforestry practices can reduce soil degradation and improve yields in drylands. Agroforestry parks in West Africa's Sahel region are diverse, given the many needs that people have to satisfy and, above all, the fact that each species can play a different role. They depend on the socio-economic, ecological and soil fertility benefits that agroforestry parks provide for local populations. Here we report on promising co-created farming systems performance in Mali, Senegal and Burkina Faso in terms of crop productivity and soil quality. The assessment of existing knowledge regarding the use of shrub/tree species in agricultural systems, as well as the identification of crop-shrub interactions appropriate to local contexts, identified a list of species that could be integrated into the design of locally relevant systems. In all three countries, a variety of on-station and on-farm trials have been set up to study the impact of tree and shrub species on soil properties, crop yields. We report on initial findings of some of the 16 on-farm and 10 on-station trials that were set up from 2020 to 2023. Most of the trials involved various ways of using shrubs as fertility amendment and testing several shrubs for their establishment, biomass productivity, quality and mineralisation/fertility potential. Productivity gradient of crops in relation to the distance to shrubs, their crop yield, dry matter productivity, harvest index, and water use efficiency are assessed. For shrubs, the observations and measurements include their pruning frequency and include dry matter productivity and rate, leaf/stem ratio. Our initial results show that using prunings of the shrubs can significantly increase sorghum yield. When some fertiliser is added the effect can be more significant. Mulched soils (with shrub biomass) have the best soil structure and the highest infiltration rate, meaning greater capture of rain water for the crops. Soil moisture content increased in plots where various shrub mulches were applied in singly or in a mixture. Our results will help farmers to rely on their local resources, reduce their external synthetic inputs and costs, improve their soil health and fertility, increase crop productivity and improve their livelihoods.

**Keywords:** Agroecology, agroforestry, drylands, mulching, Sahel, shrubs, West Africa