Tropentag, September 18-20, 2019, Kassel

"Filling gaps and removing traps
for sustainable resource management"

Intercropping *Gliricidia sepium* Improves Crops Production and Agroecosystem Resilience in Kongwa District, Dodoma, Tanzania

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Abstract

Extensive grazing and the use of crop residues for cooking energy are major drivers of land degradation in semiarid zones. Poor soil health and unreliable precipitations in these areas also limit crop production and increase susceptibility to climate change. The impacts of climate change in agriculture are aggravated further by poor farming practices, including low use of inputs, especially mineral fertiliser. This study evaluated productivity and resilience effects of *Gliricidia sepium*-based intercropping systems. The split-plot design was adopted to test the effects of cropping system (sole maize, sole pigeonpea, maize-pigeonpea, maize-*G. sepium*, and maize-pigeonpea-*G. sepium*) and fertilisation (fertilised and unfertilised). Intercropping maize with *G. sepium* and pigeonpea improved crops (maize and pigeonpea) yield by up to 33 %, besides wood and fodder supply for improved livestock nutrition. Relative to maize monoculture, intercropping *G. sepium* with maize increase rainwater use efficiency up to 36 % ($3.5\,kg\,ha^{-1}\,mm^{-1}$) and it was maximised ($9.5\,kg\,ha^{-1}\,mm^{-1}$) during the drier season (2015), reflecting beneficial effects on soil moisture retention and resilience benefits of intercropping *G. sepium*. After 5 years wood produced in the maize-*G. sepium* treatment was $5.1\,t\,ha^{-1}$, which was enough to sustain a 5-member family for 3.1 years and 2.2 years when using improved cooking stoves and the 3-stone traditional firewood stoves, respectively. Utilizing this amount of wood offset about 1.58 tons of CO_2emissions. The economic benefits of integrating *G. sepium* compared to sole maize were 3- and 4- folds increase in return to labour per day worked and gross margin, respectively. Intercropping *G. sepium* improve crop production, build resilience of farming system and offsetting emissions

Keywords: Agroforestry, climate resilience, CSA, semiarid areas, soil moisture

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