Tropentag, September 15-17, 2021, hybrid conference

"Towards shifting paradigms in agriculture
for a healthy and sustainable future"

Intercropping Maize with *Gliricidia sepium* and Pigeonpea Enhances Productivity and Resilience of Cropping Systems in Semiarid Tanzania

Anthony Kimaro[1], Johannes Michael Hafner[2], Christine Lamanna[3], Peter Steward[3], Todd Rosenstock[4]

[1] *World Agroforestry (ICRAF), Tanzania Country Programme, Tanzania*
[2] *Leibniz Centre for Agric. Landscape Res. (ZALF), Sustainable Land Use in Developing Countries (SusLAND), Germany*
[3] *World Agroforestry (ICRAF), Kenya*
[4] *World Agroforestry (ICRAF), Land Health Decisions, DR Congo*

Abstract

Low and sporadic precipitations adversely affect cropping system resilience in semiarid tropics. However, crop diversification through intercropping enhance agroecosystem resilience. We tested whether intercropping maize with Gliciridia sepium and/or pigeonpea improves productivity and drought resistance of maize under semiarid conditions. Our study adopted a split-split-plot experiment to test the effects of intercropping (maize monoculture, sole pigeonpea, maize-Gliricidia, maize-pigeonpea and maize-pigeonpea-Gliricidia), fertilisers (with and without) and rainfall (ambient and drought). Drought was induced using the above-canopy rainout shelters which intercepts 50 % of the ambient rainfall. No significant effects of rainout shelters was note on air temperature and relative humidity above the maize canopy, but photosynthetically radiation (PAR) was reduced by 15.8 %. Gravimetric soil moisture was also reduced by 12.5 %. As expected, the drought treatment reduced soil moisture, but without creating artificial growing conditions for crops. Significant effect of intercropping was noted in 2019 and 2020 seasons, which is attributed to the combined impacts of weather variability and interactions of maize with *G. sepium* and pigeonpea. Significant interactions between treatments (intercropping, fertiliser and drought) was noted in 2019 with *G. sepium*-pigeonpea intercropping under fertilisation and ambient rainfall significantly suppressing maize yield relative maize monoculture. However, maize- *G. sepium* and maize-pigeonpea intercropping did not reduce maize grain yield relative, suggest that farmers can diversify their fields with either *G. sepium* or pigeonpea without compromising yields of maize even in drought prone seasons like 2019. In 2020, fertilisation improved maize grain yields under drought by 63 % compared to ambient rainfall. Heavy and well distributed precipitations throughout the 2020 cropping season (961 mm) account for the reduction of maize yields under ambient as the rainfall amount received in the drought treatment (790 mm) was above the long-term average (425 mm) for semiarid areas of Tanzania. Overall maize yield in intercropping in 2020 was similar to the yield obtained with maize monoculture. Also, maize resistance, measured as yield loss due to drought, was higher in intercropping and land equivalent ratios were above 1 in

Contact Address: Anthony Kimaro, World Agroforestry (ICRAF), Tanzania Country Programme, P.O. Box 6226, Dar-es-Salaam, Tanzania, e-mail: a.kimaro@cgiar.org

both growing seasons. This study show intercropping maize with *G. sepium* or pigeonpea sustains productivity and improve resilience of maize cropping systems.

Keywords: Agroforestry, Climate Change, Crop diversification, Drought, Maize yield