Integrating *Gliricidia sepium* and Chololo pits enhances maize yield in semiarid Tanzania

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Introduction

- High reliance on rain-fed agriculture makes this sector vulnerable to climate change (CC) due to shifting of rainfall patterns and seasons.
- Maize based cropping systems are particularly vulnerable given that over 60% of maize is produced globally is under rain-fed farming.
- Scaling up Climate Smart Agriculture(CSA) practices build resilience and minimize CC induced economic loses, estimated at USD 200M per year for Tanzania.
- We assessed the effects of integrating agroforestry and planting basins (*Chololo* pits) under different planting windows on maize grain yield to elucidate mechanisms for enhancing resilience of maize based system in semiarid areas of Tanzania.

Materials and Methodology

- This study was conducted at Mlali Village, Kongwa district, Dodoma region, Tanzania.
- *Gliricidia sepium* was planted at a spacing of 3-m x 3-m in 2014. A factorial experiment, laid out in a RCBD with three replications, was adopted to test the effects of CSA practices (Maize monoculture, *G. sepium* intercropping and Integration of *G. sepium* and Chololo pits) and planting windows (Early, Normal and Late planting) on soil moisture and nutrient dynamics, maize grain yield and nutrient use efficiency (Fig. 1).

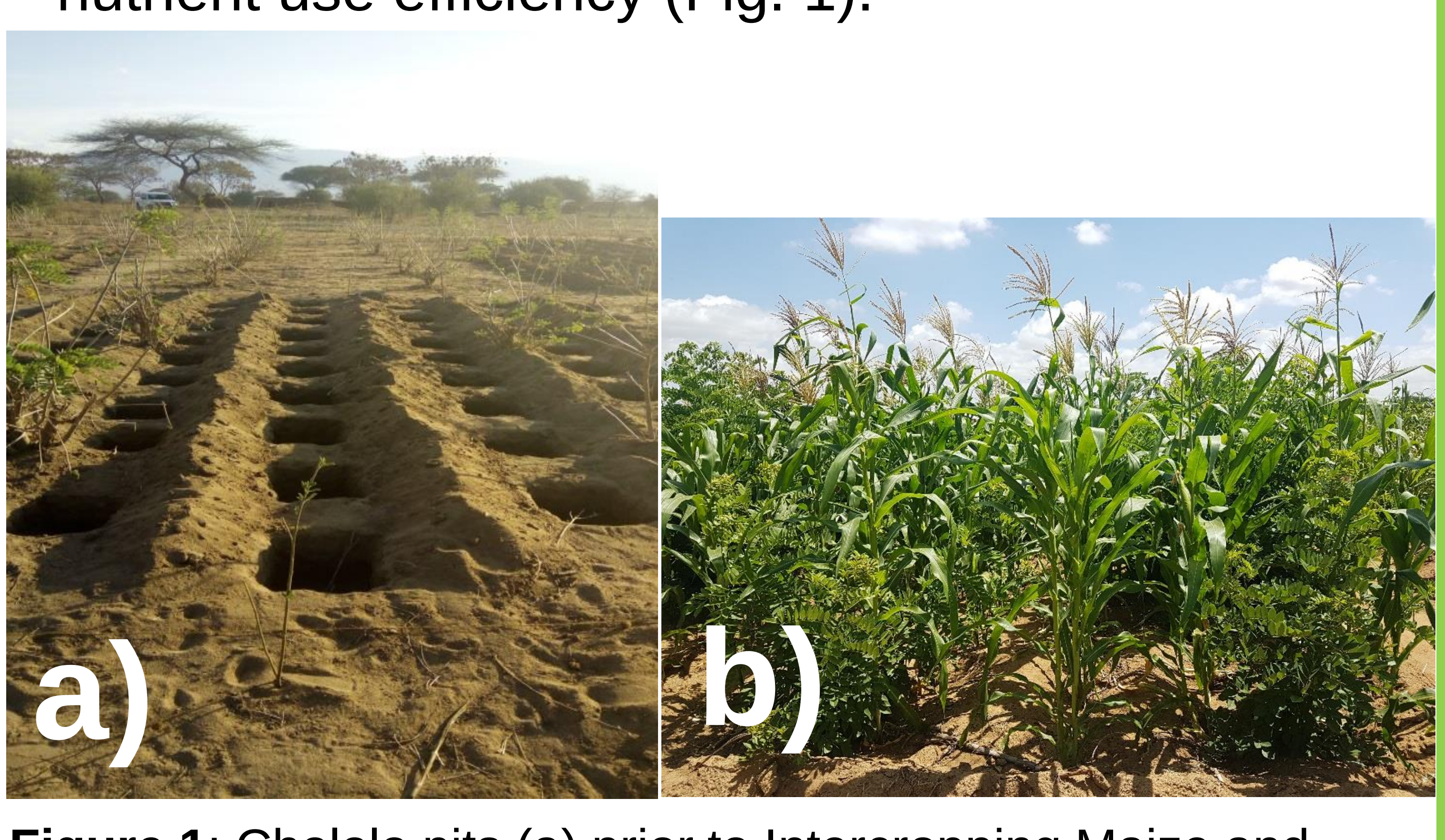

Figure 1: Chololo pits (a) prior to Intercropping Maize and Gliricidia sepium (b) at Laikala Village

Results

- Gravimetric soil water content was the highest in Chololo pits-Gliricidia (6.1 %), followed by Maize-G.sepium intercropping (4.9 %) and maize monoculture (4%) (Fig. 2)
- Maize grain yield was significantly higher (4.2 t ha^{-1}) at normal planting and with integration of *G. sepium and* water harvesting using Chololo pits (Fig. 3).

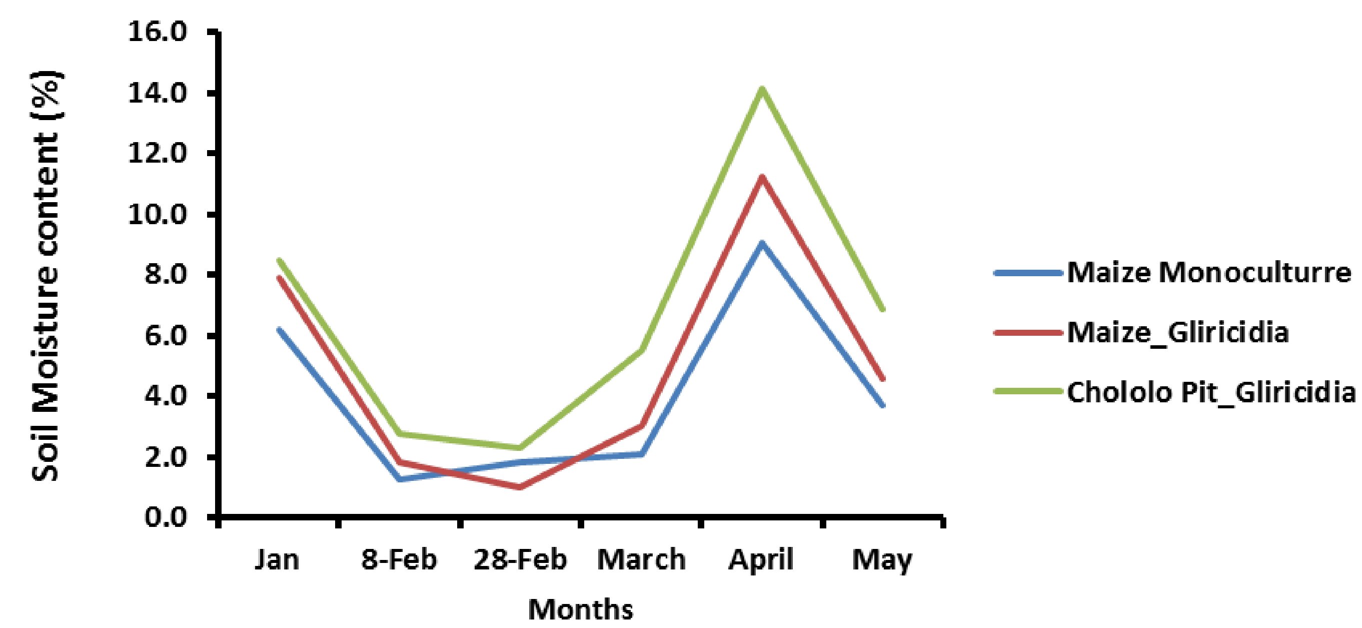

Figure 2: Effect of CSA practices on soil moisture during the 2018 growing season

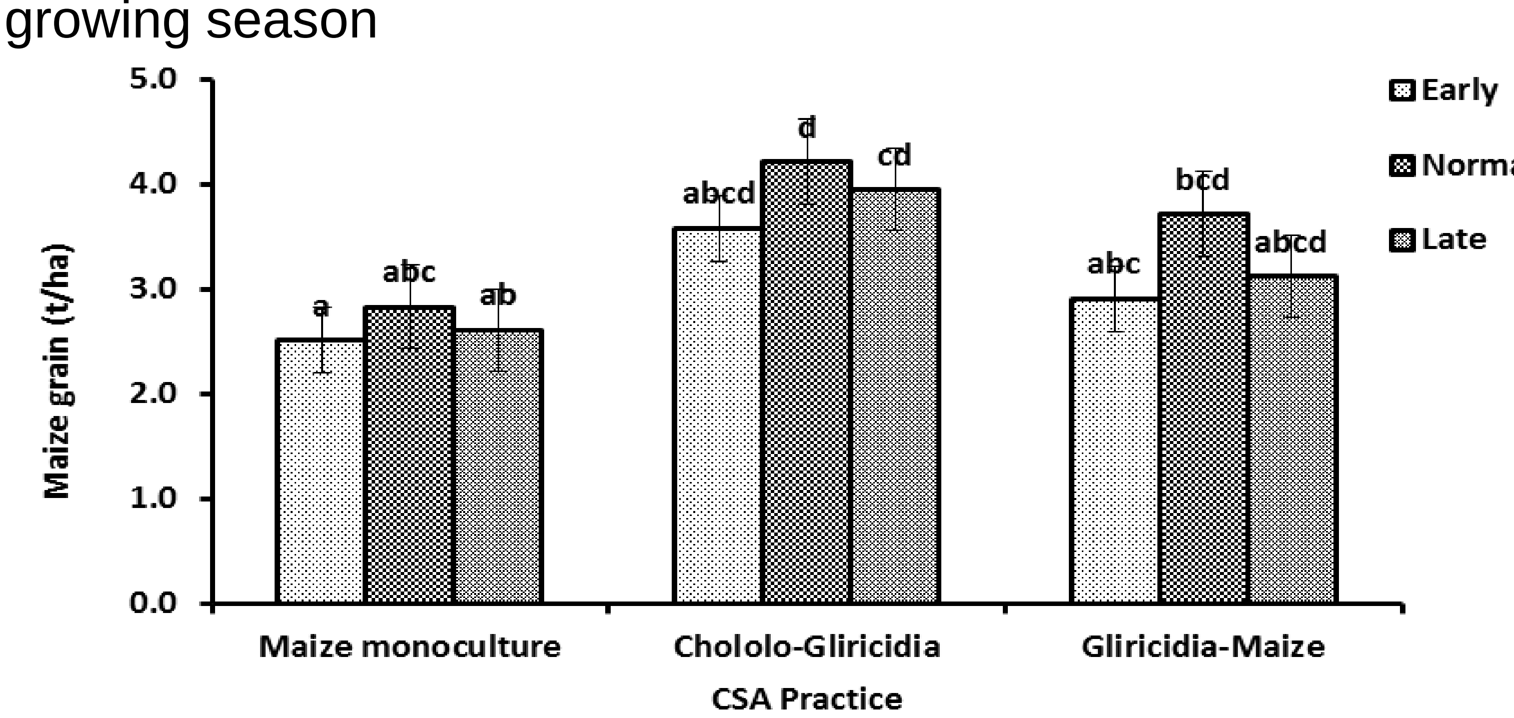

Figure 3: Effect of planting windows and CSA practices on maize grain yield

Discussion and Conclusions

- The highest maize yields in chololo pits and *G. sepium* across planting windows, reflect high resilience due to the combined effects of soil fertility and rainwater harvesting.
- Lower maize yields in early planting (mid-Nov. to mid-Dec) than normal planting is due to dry spelt effects in February (Fig. 1) that suppressed growth
- Higher maize yields in normal/TMA recommended planting (Fig. 3) affirms that this is the appropriate planting window (Mid Dec to Mid Jan.) for Kongwa.
- Combined use of weather information and CSA practice helps to build resilience and sustain crops production in semiarid areas.

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