Perspectives on agroecology

Agroecological pathways for rainfed agricultural systems towards sustainable agroecosystems and land use productivity

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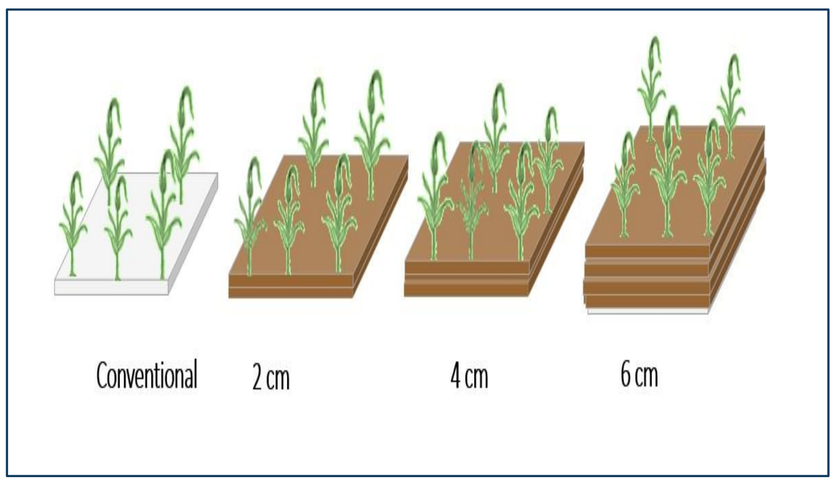
Introduction

- ❖ Rainfed farming dominates ~90% of croplands in sub-Saharan Africa.
- ❖ These systems are under pressure from land use change, soil degradation, and water shortages.
- ❖ Agroecology offers nature-based solutions for resilience and increased productivity.

Objective

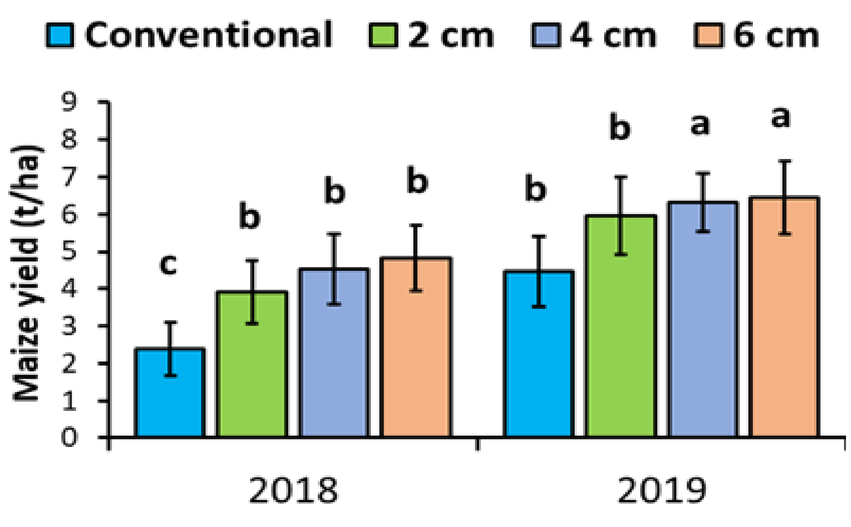
- Identify key soil and water agroecological practices.
- Evaluate impacts on soil fertility, water retention, and yields.
- Assess contributions to climate resilience and sustainable land use.

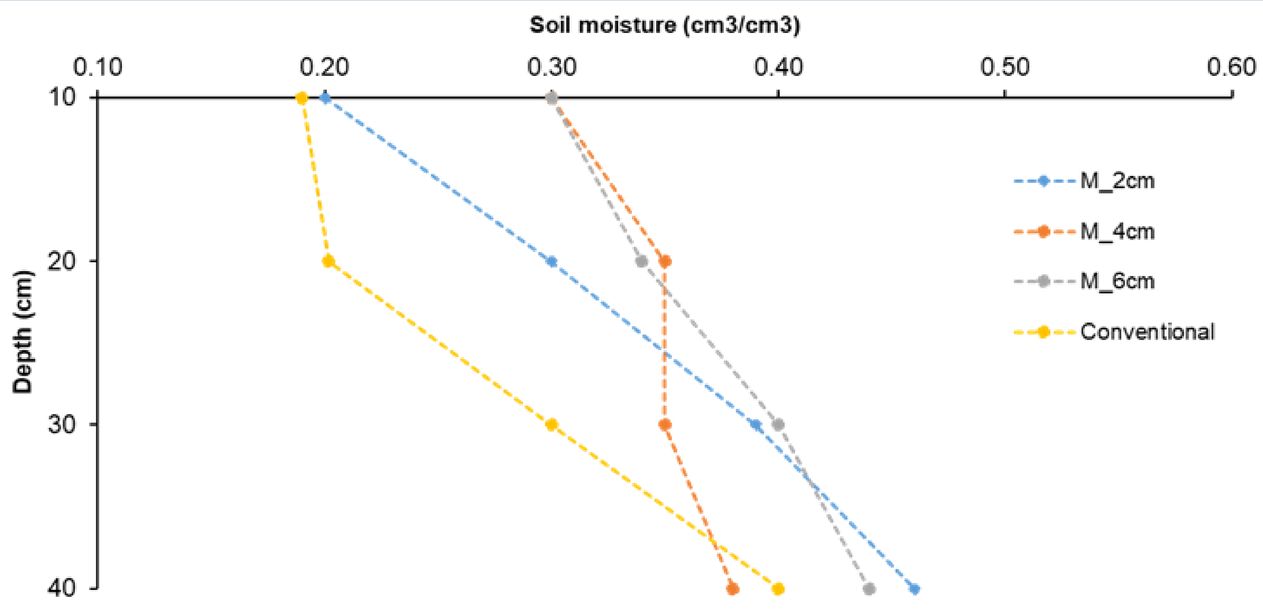


Conclusion

- ❖ Rainfed production systems continue to be threatened by unpredictable rainfall seasons.
- ❖ Agroecology practices like mulching demonstrate ability of enhancing crop water availability and boost high water use crop yield like for maize.
- ❖ However, policy and institutional support is needed to scale up such agroecological practices.

Results and Discussion





➢ Results 1

- Mulching significantly ($P < 0.05$) increased maize yield compared to the conventional practice in both 2018 and 2019.
- In 2019, yields improved for all treatments, ranging from ~4.5 t/ha (conventional) to ~6.5 t/ha (6 cm mulch).
- 4 cm and 6 cm mulch treatments recorded the highest yields in 2019 (“a”), outperforming both 2 cm mulch and conventional.

➢ Discussion 1

- Mulching boosts maize yield via soil moisture retention.
- 4 cm – 6 cm mulch offers consistent multi-season yield gains.
- Yield rise linked to rainfall and soil health.
- Mulching is effective, low-cost climate adaptation strategy.

Results 2

- 6 cm mulch retained most soil moisture consistently.
- Conventional practice recorded lowest soil moisture content.
- Mulching reduced evaporation losses at shallow depths.
- Deeper layers still favored higher mulch thickness.

Discussion 2

- Mulching improves topsoil water retention for maize.
- Thicker mulch slows evaporation, increases water infiltration.
- Reduced deep differences suggest moisture redistribution limits.
- Mulching enhances drought resilience in rainfed maize.
- Conventional systems dry faster, increasing yield risk.

Material and Methods

Field data were collected between 2018 and 2020 through participatory farmer engagements, on-farm experiments, and structured observations, with a focus on non-mechanical agroecological interventions like mulch. Randomized block design trials were conducted on farmer-managed fields to evaluate the effects of conventional and organic straw mulch applied at thicknesses of 2 cm, 4 cm and 6 cm on maize plots. Quantitative analysis of yield data was analyzed using ANOVA to assess statistical differences across the selected mulching practices using R statistical tool version 4.4.3 (R Core Team, 2024).

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