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"Development on the margin"

Beyond Climate Change Mitigation: Can Trees Buffer Moderate Temperature Increases on Croplands?

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Abstract

Traditionally, trees are considered a means of climate change mitigation through sequestering CO_2 in their biomass. Recently, awareness increased of large forest complexes having significant impact on micro- and mesoclimate, counteracting adverse climate change effects. Less evidence exists on the effects of smaller groups or even single trees that define agroforestry practices in the tropics.

There is general agreement in the projections of GCMs that many marginal regions in sub-Saharan Africa will experience substantial increases in temperature and hence evapotranspiration in the coming decades. Such additional warming will put traditional crops and cropping systems at risk. We hypothesise that the presence of trees in agricultural landscapes can create a microclimate that buffers moderate temperature increases from climate change. Instead of immediately replacing a traditional crop, the inclusion of trees may hence provide a considerable step towards the resilience of marginal agriculture to climate change.

We present first results of a study carried out in a vulnerable region of Tanzania in the transition zone between bimodal and unimodal rainfall regimes. Automatically recording weather stations were placed 50 m apart in an open maize and sorghum trial field and in an identical field under partial cover of *Acacia polyacantha* Willd. for 2 years equal to 4 cropping seasons. The continuous hourly data of air and soil temperature were compared from both stations. The overall trend showed that in reference to a regionally downscaled IPCC A1B scenario at high spatial and temporal resolution, temperatures in the agroforestry site trailed the ones on the open crop field by about 20 years.

We conclude that warranting repetitive validation at different scales and consideration of interception losses through trees, this study clearly indicates that trees can fulfil a second role in mitigating adverse temperatures and climate change in marginal lands. Including trees into farming systems can build resilience and buy sufficient time for farmers to familiarize with potentially harsher climate impacts.

Keywords: Agroforestry, climate change, cropping systems, Tanzania, temperature buffering

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