

Run-off, soil moisture, and weed management strategies to increase water productivity in rain-fed crops in Tanzania



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Introduction

Smallholder crop production systems in the semi-arid Dodoma region frequently suffer from drought-induced yield losses due to inadequate rainfall distribution and erratic rainfall events. The 30 year average rainfall amount of 500 mm during the rainy season (from December until May) indicates that in general precipitation is sufficient for the crops to mature.



Figure 1: Top: Tied-ridges in a sorghum crop. Water is collected in basins and has time to infiltrate into the soil to increase soil moisture and reduce run-off
 Bottom: Experimental field; left: pearl millet without tied ridges, right: pearl millet with tied ridges

Conclusions

- ▶ Tied-ridges ensured maize and pearl millet yields (see pictures left)
- ▶ Sorghum was the only crop producing grain yield without run-off management.
- ▶ Increased weeding frequency was not improving yield.

Outlook

Tied-ridges and crop diversification are an opportunity to avoid total crop failure and to increase food security.

Results and Discussion

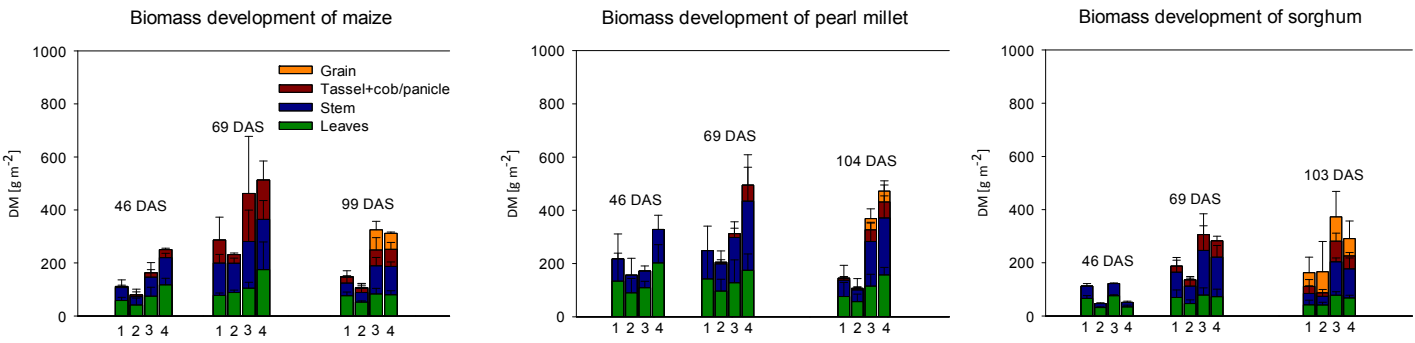


Figure 2: Biomass development in dry matter (DM) of maize, pearl millet and sorghum at 46, 69 days after sowing (DAS) and at harvest. Values are given as mean \pm SE.
 1=Rainfed+FW, 2=Rainfed+CW, 3=Tied Ridges+FW, 4=Tied Ridges+CW, FW=farmer's weeding (weeding after emergence and canopy closure), CW=clean weeding

- No run-off management lead to crop failure
- Tied-ridges mitigated effects of severe drought spells during flowering and fruit development
- Drought sensitive at the end of the season
- Fast and high biomass production
- Plants on flat plots stagnated in phenological development during booting or heading
- Susceptible to water shortage during reproductive stage
- Tied-ridges increased total biomass production
- Grain yield remained fairly stable
- Highest water stress tolerance

Material and Methods

The experiments were conducted at the Agricultural Research Institute (ARI) Makutupora, Tanzania during the wet season from January until May 2015 and 2016. Soil moisture was measured frequently using a PR2 Profile Probe. Leaf area, crop development stages, biomass accumulation and partitioning and yield components were determined at harvest.

Table 1 (right): Mean rainfall (from 1980-2010) and precipitation from the growing season 2015 (Jan-May);
¹measured at Dodoma airport; ²measured at ARI-Makutupora

Month	Jan	Feb	Mar	Apr	May	Season
Mean rainfall from 1980-2010 (mm) ¹	110	108	100	49	5	372
Growing period 2015 (mm) ²	112	103	27	86	1	329

