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Climate-smart agriculture practices influence on sorghum performance and soil water content in the central highlands of Kenya

JANE OMENDA¹, MILKA KIBOI², FELIX NGETICH³, GERD DERCON¹, DANIEL MUGENDI⁴, JAYNE MUGWE⁵, MONICAH MUCHERU-MUNA⁵, JAN DIELS⁶, ROEL MERCKX⁶

¹*International Atomic Energy Agency, Dept. of Nuclear Sci. and Applications, Austria*

²*Research Institute of Organic Agriculture (FiBL), Dept. of Intern. Coop., Switzerland*

³*Jaramogi Oginga Odinga University of Science and Technology (JOOUST), School of Agricultural and Food Sciences, Kenya*

⁴*University of Embu, Dept. of Water and Agricultural Resource Management, Kenya*

⁵*Kenyatta University, Dept. of Agricultural Sciences and Technology, Kenya*

⁶*KU Leuven, Dept. of Earth and Environmental Sciences, Belgium*

Abstract

In 2019 a long-term trial was established in the drylands of Tharaka-Nithi County Kenya. The objective was to provide research-based evidence on the synergistic effects of integrating soil and water conservation practices and soil fertility inputs on sorghum performance and soil water content. The experimental trial adopted a Randomised Complete Block Design with three levels of nitrogen fertilisation (120, 60, and 30 kg ha⁻¹) with four replications. We evaluated four soil and water conservation technologies (minimum tillage, mulching, tied ridges, and Managing Beneficial Interactions in Legume Intercrops (MBILI) along with a control (farmers' practice). The trial so far has consisted of a 9-season, five-year on-station trial with sorghum as the test crop planted during the long rainy season (March to July) and the short rainy season (October to February). Data were subjected to analysis of variance (ANOVA) using SAS version 9.4 and means were separated using Tukey-Kramer Honest Significant Difference Test 0.05. Generally, significant (p 0.05) improvement in soil moisture was observed by 40 and 35 % by minimum tillage with mulch and tied ridges respectively. The highest yield (4.85 Mg ha⁻¹) and highest water use efficiency (1.17 kg m⁻³) were observed under minimum tillage treatment. Across the seasons, the best treatment combination for improving sorghum yield was minimum tillage with mulch at 120 kg N ha⁻¹ rate of the goat manure and mineral fertiliser. Our findings demonstrate that the use of minimum tillage with organic and inorganic fertility inputs can bridge the yield gaps in Kenya depending on the regional condition.

Keywords: Mineral fertiliser, minimum tillage, soil moisture, sorghum tied ridges