Multi-dimensional impacts of tropical forage technologies in Sub-Saharan Africa: A meta-analysis

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Abstract

Tropical forage technologies have been disseminated across Sub-Saharan Africa (SSA) and are expected to impact positively on productive, economic and environmental performance of farming systems. To date, few studies have provided a comprehensive and quantitative overview on multi-dimensional impacts of introducing tropical forage technologies across different farming systems and agroecologies in SSA. To address this, we set out to systematically review and quantify multi-dimensional impacts of various forage technologies on soils, pest and disease occurrence, fodder and food production, farm economics, and livestock production. A systematic literature search was conducted with Scopus, the largest database of peer-reviewed literature. Specific search terms were used to extract forage related publications from SSA. 71 studies with a total of 656 observations were included in the analysis, carried out in R-statistical programming software. Response ratios (treatment over control) of forage technologies were estimated on various productive, economic and environmental indicators. Preliminary results show that improved grasses increase herbage dry matter yield by 280.2% than the respective control treatments. Supplementing baseline natural grasses with herbaceous legumes increased milk
production by 29.7%, while supplementing with leguminous shrubs the increase was only 10.4%. However, leguminous shrub supplementation also resulted in 50.1% increase of liveweight gains of livestock compared to 41.5% when supplementing with herbaceous legumes. Cultivation of grasses led to the highest soil-loss reduction of 82.6% compared to 47.8% with shrubs and 54% with shrub-grasses intercrops.

This meta-analysis provides the basis for understanding the range and magnitude of multi-dimensional impacts of improved tropical forage technologies in SSA. The results can be used by environmental and agricultural scientists and practitioners to target and design mutually improved livestock feeding interventions and environmental benefits.

**Keywords:** improved tropical forages, meta-analysis, multi-dimensional impacts, soils impacts, crop and livestock performance