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## Napier Grass Productivity under Different Cropping and Fertilisation Systems in Lushoto Highlands, Tanzania

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### Abstract

In Tanzania, 21.3 million cattle are reared by estimated 1.7 million smallholder farmers. Only 1 million of these cattle are improved dairy breeds, while the rest are East African Zebu. Tanga is one of the most important dairy production regions, together with other highland areas such as Arusha and Kilimanjaro. Poor feed resource base and quality are among the main challenges of livestock production, resulting in low milk yields of 5–10 liters day<sup>-1</sup> from an improved dairy breed.

Forage technologies have been promoted in Tanzania for sustainable intensification of crop-livestock systems. However, there is a dearth of research that quantified the impacts of these systems on productivity and natural resource management. One probable reason for the lack of research is that the effects of planted forages on the environment, especially soils, can only be recorded after many years of observation. To address this issue, computer modelling tools can be used to estimate numerous forage technologies and their effects on the environment. CropSyst is a widely used cropping system model for simulating the growth and productivity of crops in response to various environmental conditions. Among many other biophysical variables, CropSyst is able to simulate soil C dynamics, N<sub>2</sub>O emissions, N leaching, soil erosion and soil water dynamics.

This study presents preliminary results from a forage trial in two villages in Lushoto district in Tanga region, Tanzania. The trial was laid out in a completely randomised block design (three replications) in November 2014 on farmers' fields. The trial consists of three treatment factors: forage species (local Napier, Napier hybrid, *Brachiaria* hybrid cv. Mulato II); soil fertility level (no manure, with manure); and cropping system (mono-cropped or intercropped with *Desmodium uncinatum* cv. Silverleaf). Assessed agronomic performance included establishment, biomass production, leaf area index, emergence, tillering, and forage quality. Soil was analysed and climate data obtained from the nearby weather station. All data was used to calibrate CropSyst for Napier, and to test a new intercropping routine for the model.

**Keywords:** Agronomic trials, crop modelling, intercropping, tropical forages