

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

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Background

- Tanga is one of the most important dairy production region in Tanzania
- In Tanzania, 21.3 million cattle are reared by 1.7 million smallholder farmers. Only 1 million of these are improved dairy breeds, while the remainder are East African Zebu
- Dairy cows are kept in confinement and availed with fodder on daily basis
 However, limited feed availability and poor feed quality, result in low milk yields of 3-5 liters per day for improved dairy breeds.
 To address this, tropical forage technologies have been promoted in Tanzania for sustainable intensification of crop-livestock systems.
 However, adoption remains low and the gap in improving milk yields still not closed.



Materials and methods

Two on-farm sites were selected (Mbuzii, Ubiri) in Usumbara Highlands, Tanga region where smallholder farmers practice dairy.
Treatments tested included : local Napier, Napier hybrid, *Brachiaria* hybrid cv. Mulato II); Manure levels (no manure, manure); and cropping system (monocropped or intercropped with *Desmodium*)



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- Napier grass was spaced at 1 x 1 m², while desmodium was at 0.3m x 1m, and where intercropped, desmodium rows were between Napier grass or brachiaria
- The treatments were laid out in the field in a completely randomly block design replicated three times, and at the two sites.
- Agronomic data collected included biomass production harvested every 6 weeks, leaf area index (LAI), and number of tillers. Biomass was based on dry matter yields estimated from samples dried at 65°C for 48 h, while LAI was estimated using accupar
 The data were analyzed in *GenStat* software version 14 and means separated by least significance difference (LSD)

Table 1. Means of leaf area index (LAI), tiller numbers and height,

 over three growth cycles at Ubiri and Mbuzii

Harvest Site Ineaction number (m) Lat Cut 1 Ubiri Hyb X Manu. 2 0.87 1 Hyb X no Manu. 15.7 0.74 0.78 1.00 Loc X Manu 8.5 0.88 1.36 Loc X no Manu. 7 0.68 1.25 <i>LSD p=0.05</i> 5.2* 0.2 0.44* Mbuzii Hyb X Manu 9.2 0.81 1.22 Hyb X no Manu. 6.3 0.67 0.97 1.13 <i>LSD p=0.05</i> 2.63* 0.15 0.28* Cut 2 Ubiri Brac. X Manu. 3.0 0.67 0.97 Hyb X Manu. 19.7 1.47 0.77 1.31 1.52 0.72 Loc X Manu. 10.3 1.37 1.14 Brac. X no Manu. 10.7 1.47 0.77 Hyb X no Manu. 19.7 1.47 0.72 1.47 0.72 Hyb X no Manu. 18.7 1.13 0.37 1.52 0.7
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LSD p=0.05 29.5* 0.17* 1.47*
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Hyb X Manu X no Des. 65.3 0.86 0.9
Hyb X no Manu X Des. 55.3 0.73 0.34
Hyb X no Manu X no Des. 86.7 0.73 0.42
Loc X Manu X Des. 44 0.95 0.83
Loc X Manu X no Des. 56.7 0.73 1.5
Loc X no Manu X Des. 43.3 0.84 0.91
Loc X no Manu X no Des. 33.7 0.76 0.77
LSD p=0.05 54.2* 0.23 0.82

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Ubiri Mbuzii	Ubiri	Mbuzii	Ubiri	Mbuzii
Cut 1 Cut 2		Cut 3		

Figure 1. Means (+/-) SE of the biomass yields (t/ha) across the treatments over three growth cycles at Ubiri and Mbuzii

Discussion and conclusion

- During the first (and the second) growth cycle, Brachiaria and Desmodium had not established well and were thus only harvested from the second (and third) cut respectively
- In the first two growth cycles, Local Napier produced higher biomass than the hybrid, with a clearly higher biomass where manure was applied. In cycle 3 that had Desmodium, biomass was generally higher where Napier was intercropped with Desmodium (Miano *et al.*, 2004), and was higher for Napier than Brachiaria-desmodium intercrop.
- Hybrid Napier produced higher number of tillers than local Napier throughout all three growth cycles. However, this did not translate into higher biomass suggesting the tillers were thin as both cultivars produced largely similar (P > 0.05) plant height. Leaf area index (LAI) values were higher in growth cycle 3 than either in cycle 1 or 2. Local Napier generally

had higher LAI than hybrid Napier especially in first growth cycle explaining the relatively higher biomass in Local Napier.

• Bachiaria under either manure or Desmodium intercrop did not out-yield either of the Napier provenances, but Brachiaria-Desmodium intercrop had the highest canopy (P < 0.05), attaining LAI constant of 4.37

• In conclusion, intercropping with Desmodium with either of the grasses increases the dry matter yield per unit area which, especially under manuring. Therefore, smallholder dairy farmers should preferably grow Napier when intercropped with Desmodium for increased forage productivity.

• Future research will highlight forage nutritive values, soil quality and climate data. This data enables us to model data with the CropSyst model for scenario evaluation, eg growth under changing climate, or impact of the different treatments on N_2O emissions

Presented at 'Management of land use systems for enhanced food security: conflicts, controversies and resolutions' Tropentag conference,16-18 Sep. 2015, Humboldt-Universität zu Berlin, Berlin, Germany





Acknowledgement

We acknowledge the financial support from a USAID Linkage grant under the CGIAR Research Program on Livestock and Fish. The support from the agricultural extension officer at Mbuzii and Ubiri and the farmers who participated in the trails is highly appreciated.

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