

Nitrogen inputs from smallholder farming in a tropical montane catchment - current state and outlook

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INTRODUCTION

- The Mau Forest Complex (Figure 1) in western Kenya is one of the country's most important 'water towers', serving 5 million people, agriculture and industry with fresh water.
- Agricultural expansion and settlement resulted in 25% forest cover loss in the Mau Forest Complex over a period of 40 years (Swart 2016).
- Reported double annual export quantities of nitrogen from smallholder agriculture, from the native forest /natural ecosystem (Jacobs et al. 2018).
- Empirical information on the amount and spatial distribution of nitrogen inputs into the smallholder agriculture area is still scarce.

→ This study aimed at determining the quantity and spatial distribution of fertilizer inputs in a smallholder catchment in the Mau Forest Complex.

METHODS

Study area

- Headwater catchment (27 km²) of the Sondu river, western Kenya (Figure 2).
- Part of the South West Mau block of the Mau Forest Complex.
- Characterised by smallholder farms with median farm size of 1.2 ha.

Data collection

- Farm households survey ($n=185$) and key informant ($n=1$) in the Kiptororo Ward, Kuresoi North subcounty, Nakuru County (Figure 2).

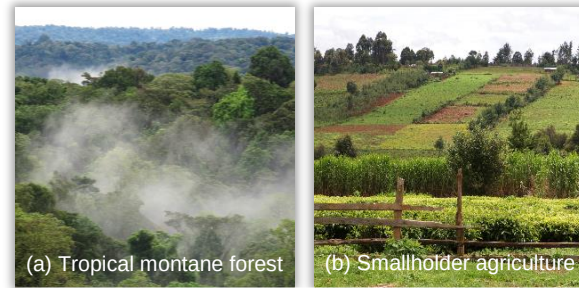


Figure 1: Dominant land use types in the Mau Forest Complex.

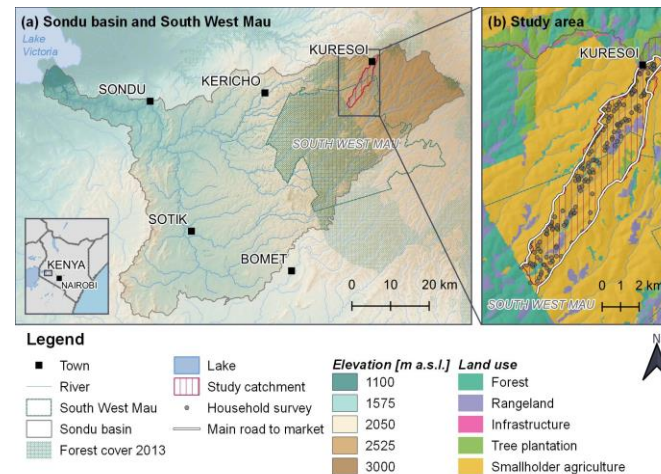


Figure 2: Location of the study area and of the participating households in Sondu basin.

RESULTS

- Almost all farmers (99.4%) apply inorganic fertilizers to their fields (Table 1), but highest application rates are observed closest to the market centre (Figure 3).
- 6% of the cropland is fertilized using animal manure.

Table 1: Inorganic fertilizer types, usage and application rates.

Fertilizer type	Nitrogen content (%)	Percentage users (%)	Mean±SD application rate (kg N ha ⁻¹ y ⁻¹)
Diammonium phosphate (DAP)	18	98.9	40.9±7.8
Calcium ammonium nitrate (CAN)	26	11.4	29.2±5.3
Nitrogen phosphorus potassium (NPK)	25	15.6	79.3±3.9
Total inorganic N application		99.4	63.7±13.7

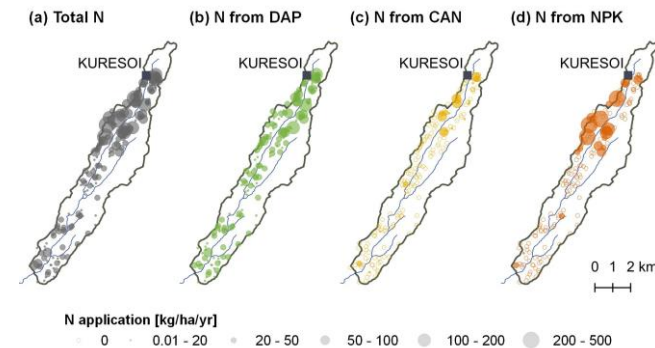


Figure 3: Spatial distribution of inorganic fertilizer application rates.

CONCLUSION

- Anticipated future increase in nitrogen application raises concern on water quality and clean water
- Farmers training on methods, timing and amounts of fertilizer application is crucial to prevent unnecessary losses.

References

- Swart, R., 2016. Monitoring 40 years of land use change in the Mau Forest Complex, Kenya. A land use change driver analysis. (MSc thesis). Wageningen University, Wageningen, the Netherlands.
- Jacobs, S.R., Weeser, B., Guzha, A.C., Rufino, M.C., Butterbach-Bahl, K., Windhorst, D., Breuer, L., 2018b. Using high-resolution data to assess land use impact on nitrate dynamics in East African tropical montane catchments. *Water Resour Res* 54, 1812–1830. <https://doi.org/10.1002/2017WR021592>