

Causes of Variability in Climbing Bean Farming Systems Across Different Farm Types in Northern Rwanda

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Introduction

- Climbing beans play a major role in central African highland farming systems
- Demand of bean consumption exceeds production
- Development programs such as N2AFRICA aim to provide legume technologies for intensification
- Current yields, biological N-fixation (BNF) and niches for intensification remain insufficiently known

Methods

- Detailed systems characterisation of 12 farms and 23 fields in Burera sector (Figure 1)
- Farm stratification according to the governmental household typology Ubudehe
- Data collection on resource flows, soil properties, yields, BNF and field management
- BNF was measured above ground using the natural abundance method

Table 1. Farm characteristics across farm types (means of 3 farms per farm type)

Farm type	Stake density (no. ha ⁻¹)	Dry grain yield (Mg ha ⁻¹)
1 Very resource poor	18 200	1.18
2 Resource poor	18 900	1.14
3 Resource rich	24 800	2.02
4 Very resource rich	22 000	2.27

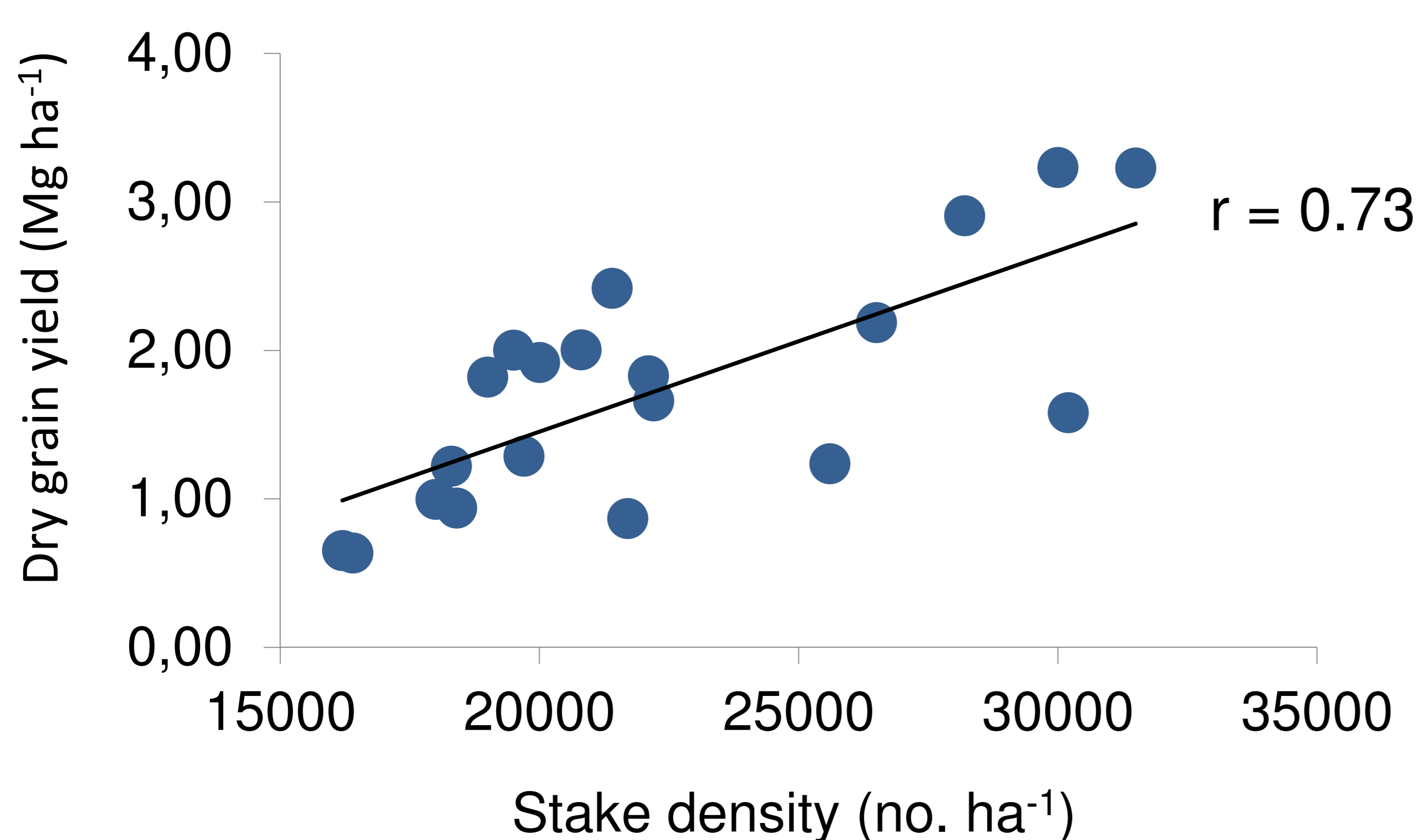


Figure 2. Effect of stake density on dry grain yield ($n = 20$)

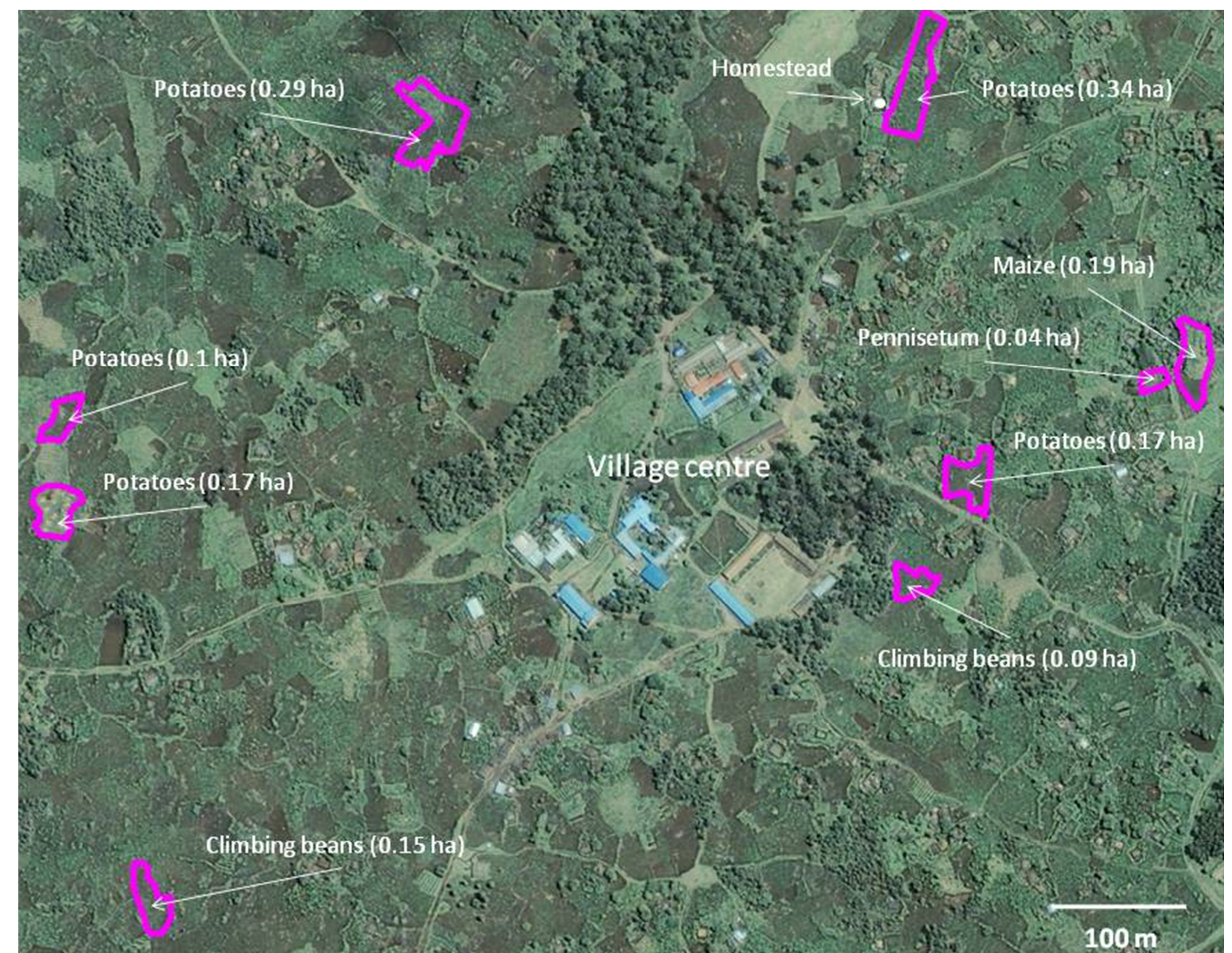


Figure 1. Farm layout of one sample resource rich farm

Results

- Staking density and height correlated significantly with dry grain and biomass yield (Figure 2)
- Resource poor farmers had less access to stakes, achieving lower grain yields (Table 1)
- On average, an estimated 50% of the plant N was derived from the air, and 93 kg N ha⁻¹ was fixed in all above- and below-ground plant parts
- Partial N-budgets ranged from -80 to 45 kg N ha⁻¹
- Much of the variation could be explained by the bean residue management
- Resource poor farmers had the lowest partial N-budgets as they removed most of the residues for feed

Conclusion

- The governmental typology Ubudehe was useful to explain variations in resource use and productivity
- Niches for intensification were farm type dependent e.g. resource poor farmers could benefit from improved access to stakes
- Benefits from BNF depended largely on the farmers' bean residue management

Acknowledgements

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