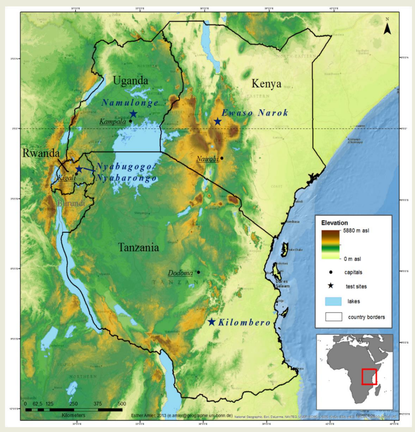
Potential of Agronomic Management Options on Rice Production in Valley Swamps of Uganda

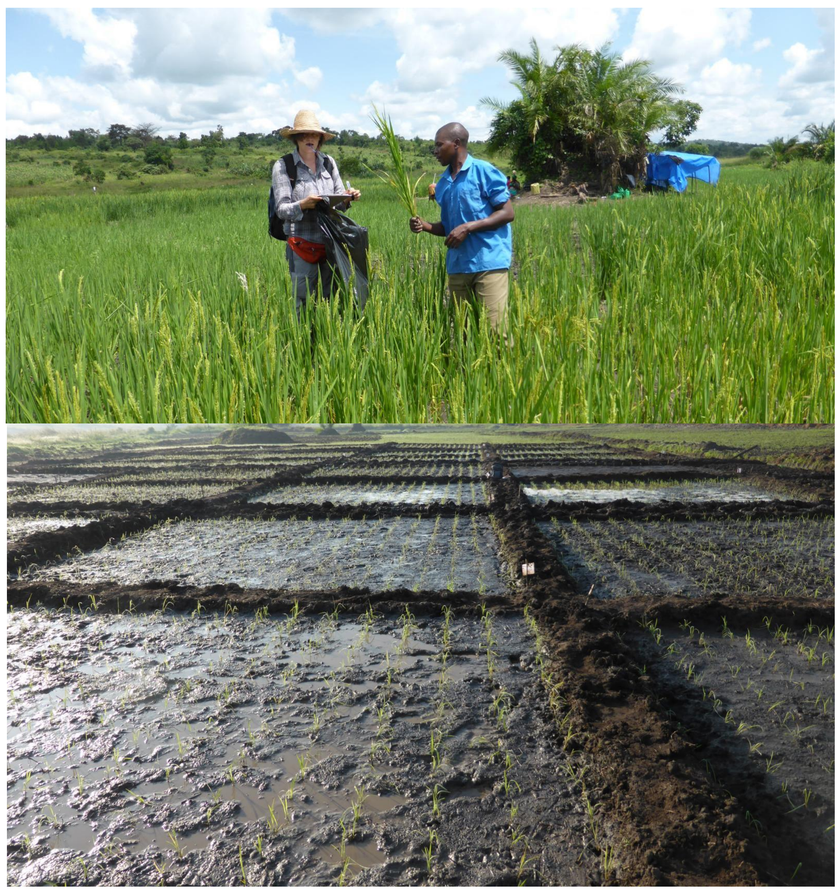
S. Ziegler, D. Neuhoff, K. Senthilkumar, M. Becker, U. Köpke

Introduction

East African wetlands are widely unused, however their potential for agricultural production expected to be high. Comprehensive agricultural intensification strategies need to be identified implying environmental protection of wetlands.

We are investigating agronomic options for rice production at different positions of a valley bottom swamp in Uganda in an interdisciplinary team.





Objectives

- Assess key yield-limiting factors in rice (bunds, weeds, nitrogen)
- Investigate effects of mineral fertilizers and organic amendments on rice productivity
- Evaluate crop rotation effects on soil parameters and yields
- Compare valley positions (fringe, middle, center) and use intensification (single, double rice) on rice productivity

Material & Methods

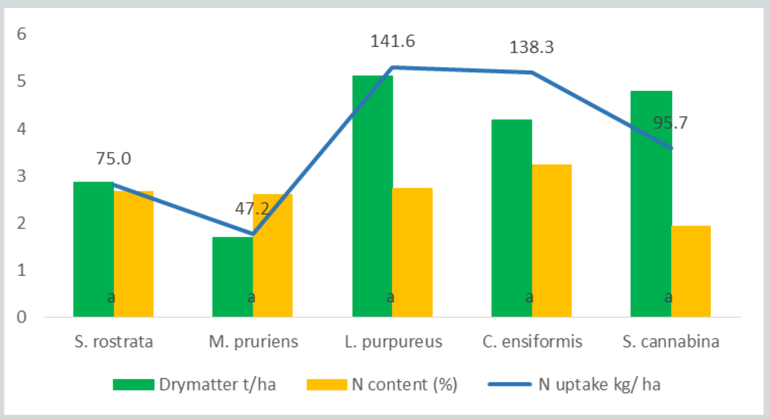
- Transplanted rice *(cv* NERICA-4)
- Three positions (fringe, middle, center)
- Ten treatments (control, mineral N, organic amendments) in 4 reps; RCB
- Five green manure legume species in the pre-rice niche

Study topic	Treatment	Agronomic details
Recovery Study	Natural Vegetation Recovery	initial ploughing, regrowth of semi-natural vegetation
Yield Gaps (YG)	Farmer´s Practice	no bunding, 1 time weeding, 0 N
	YG – bunding, weeding	0 N
	YG – Urea-N	60 kg N ha^{-1}
	Max. attainable yield	120 kg N ha^{-1}, 60 kg P ha^{-1}, 60 kg K ha^{-1}, irrigated
Alternative Options	Green manure	2 month pre-cropped *L. purpureus* (approx. 60 N)
	Organic manure	pre-cropped *L. purpureus* + chicken manure (approx. 120 N)
Intensive Systems	Double crop –control	rice cropped twice per year, 0 N
	Double crop – NPK fertilizer	120 N, 60 PK, irrigated
	Double crop – organic manure	pre-cropped *L. purpureus* + chicken manure (approx. 120N)

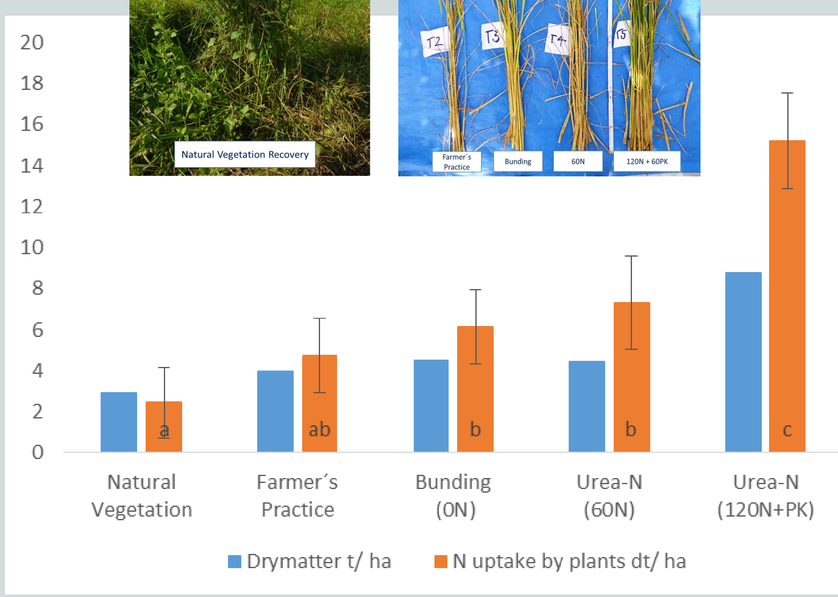
Findings

- **Farmers' rice yields of 2 - 3 Mg ha^{-1}, max. attainable yield up to 7.4 Mg ha^{-1}**
- **Manual weeding and building of field bunds double yields in valley fringes**
- **Organic amendments increase yields particularly in center position**
- **Legume in pre-rice niche can supply 142 kg N ha^{-1} to succeeding rice crop**
- **Organic manure can replace approx. 100 kg ha^{-1} of mineral N**

Results – Green Manure

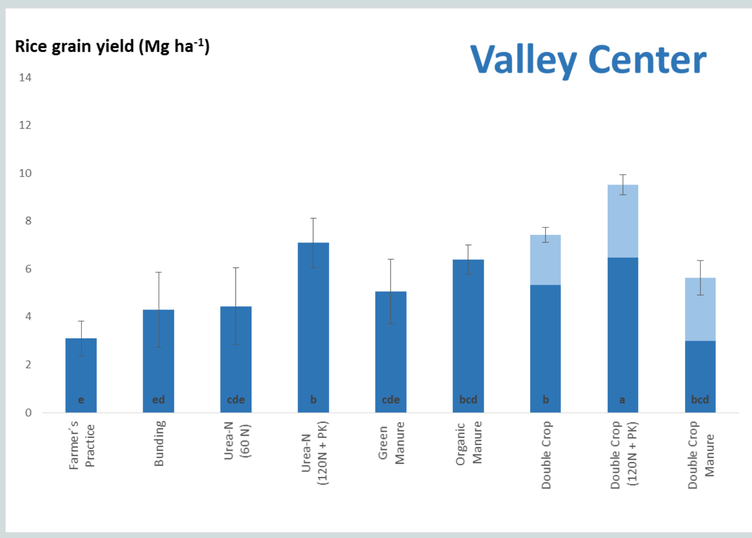


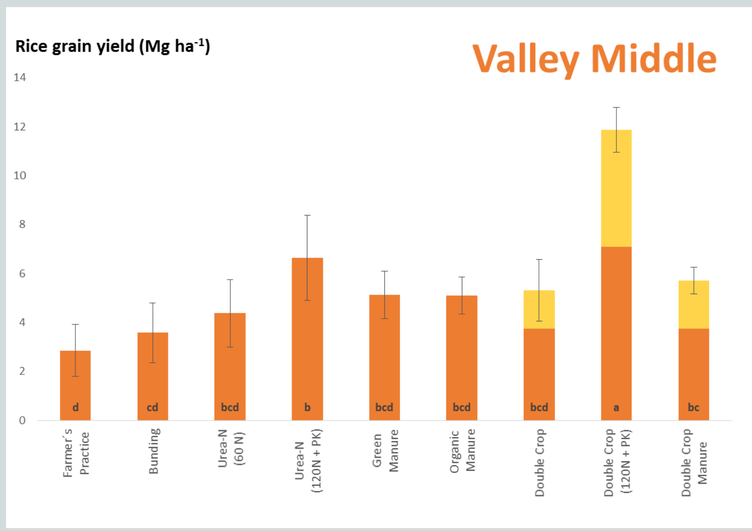
Biomass accumulation and N content of five green manure species (9 weeks, valley center position)

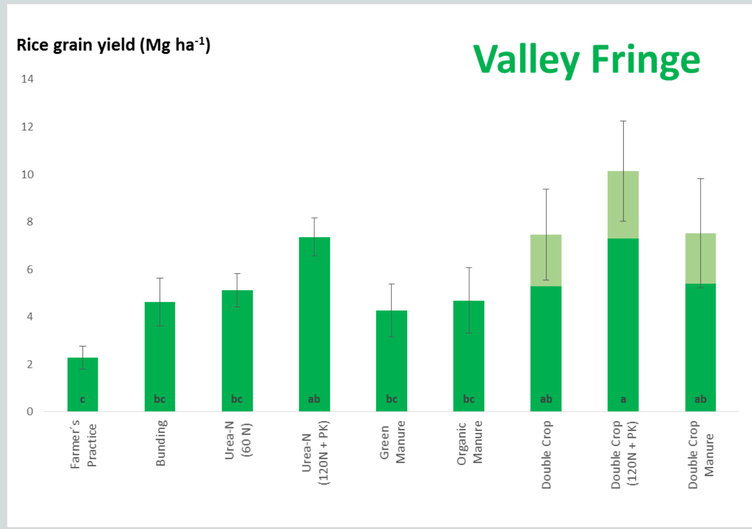


Biomass accumulation and potential N removal from wetlands depending on use and treatment across sites

Results – Rice







Grain yield of rice as affected by nine different treatments at three different valley positions

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http://www.wetlands-africa.de
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Susanne Ziegler
University of Bonn, Germany
Institute of Organic Agriculture
sziegler@uni-bonn.de

IOL Institut für Organischen Landbau
NaCRRI National Crops Resources Research Institute
Ministry of Water and Environment Republic of Uganda
INRES Institut für Nutzpflanzenwissenschaften und Ressourcenschutz
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