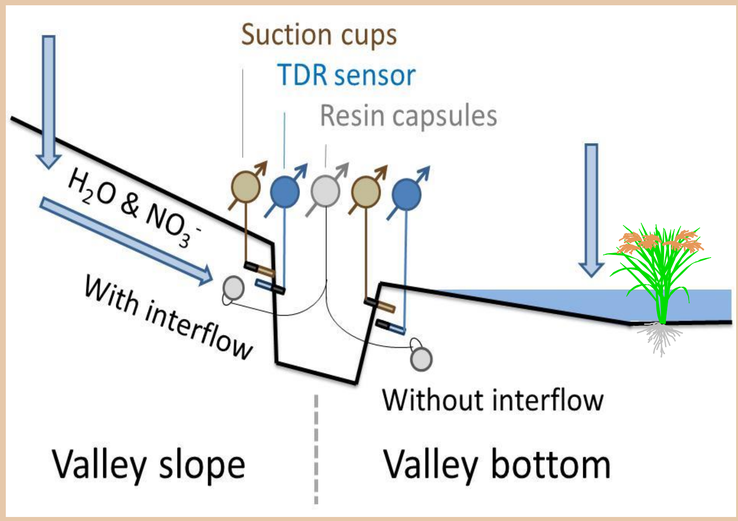
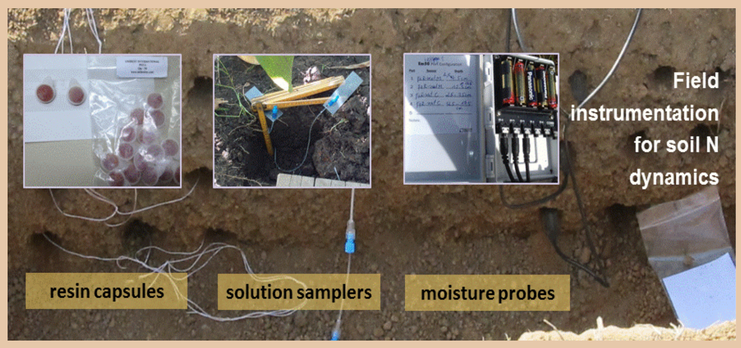
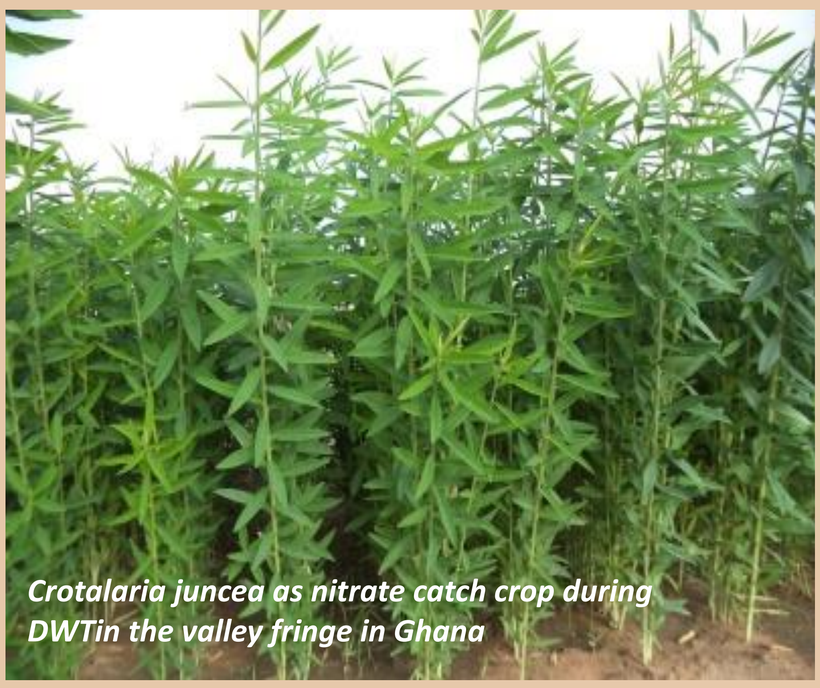
Nitrogen dynamics in inland valley of northern Ghana

Michael Asante et al.

Nitrogen deficiency characterizes rice production in inland valley of West Africa's dry savanna zone. Intensive soil N mineralization with vertical and lateral nitrate fluxes typically occurs in inland valleys during the dry-to-wet season transition (DWT). Low-input orientation requires an efficient use of system's internal resources. We studied nitrate fluxes along toposequences, quantified the contribution of (sub)-surface fluxes to the valley bottom, and assessed the effects of managing native and biologically-fixed N on the yield of lowland rice.







Crotalaria juncea as nitrate catch crop during DWTin the valley fringe in Ghana

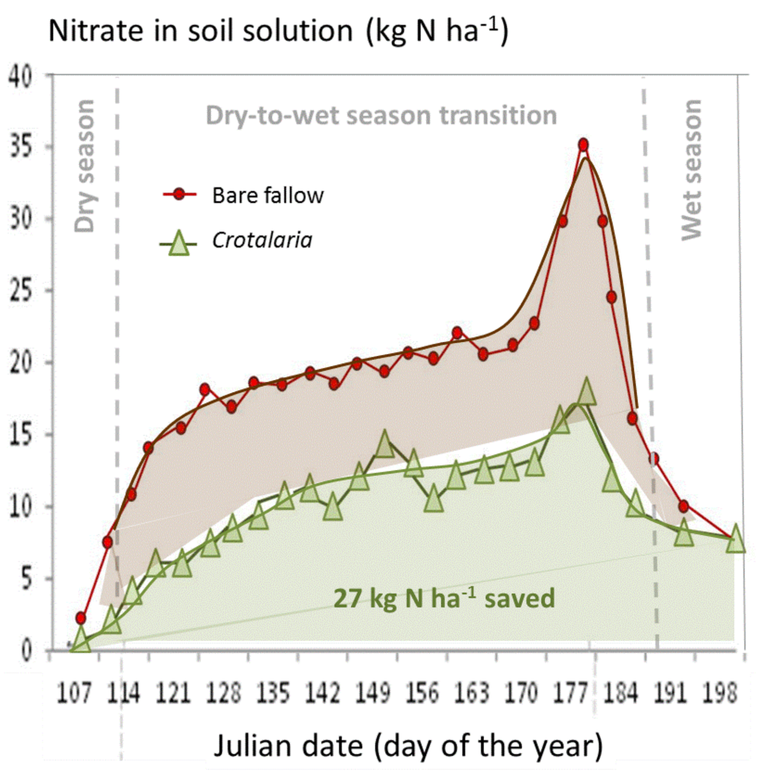
N-mineralization peaked towards the end of DWT with 56 kg nitrate-N ha^{-1}

Valley slopes contributed 50 L H_2O per m width or 32 kg nitrate-N ha^{-1}.

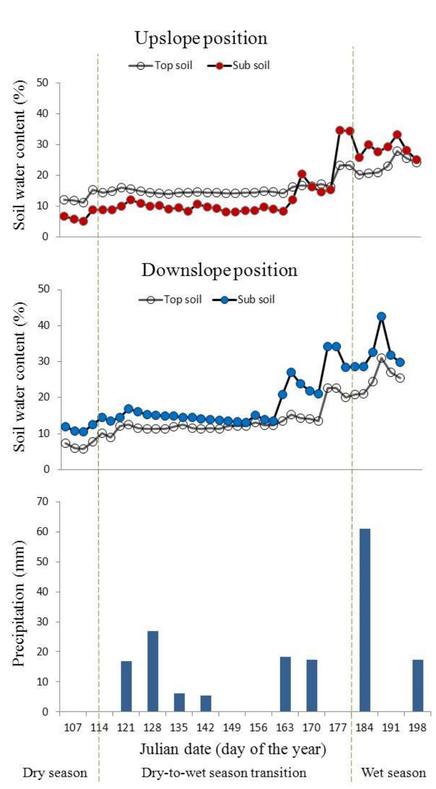
Pre-rice crops conserved 27 kg nitrate-N and added 34 kg ha^{-1} BNF -N

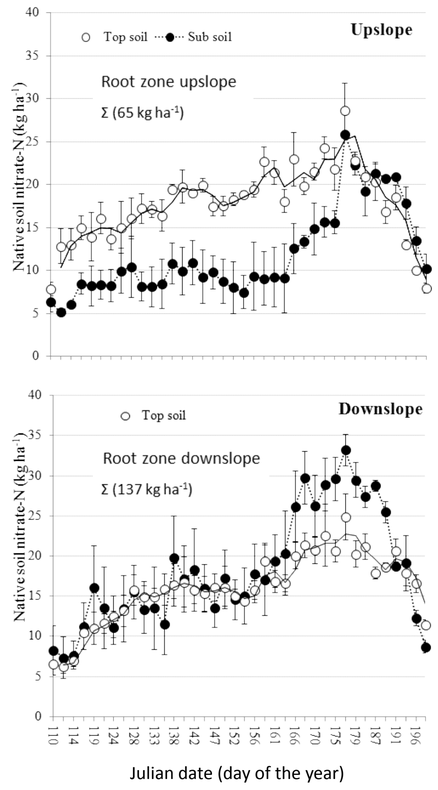
Resulting rice yield increased by 86% to 3.8 Mg ha^{-1}

Flow interception and measuring devices in the valley fringe in Ghana



Effect of management options on *in-situ* soil nitrate-N dynamics during DWT





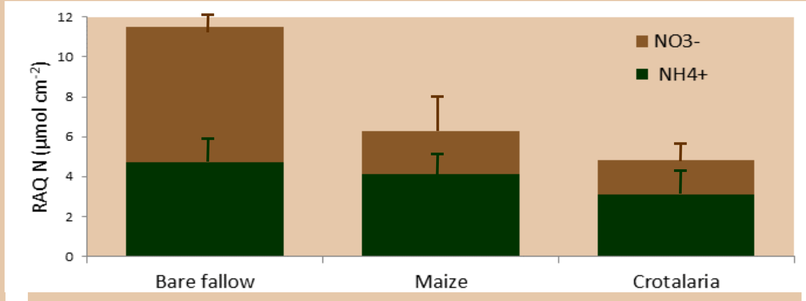
Volumetric soil moisture (left) and nitrate N (right) in top (0-20) and subsoil (20-40cm) during DWT

Response of rice to N saving and N addition by transition season options

Transition season treatment	N cycled	N added	N uptake	Rice yield
	---------- kg N ha^{-1} ----------			-- Mg ha^{-1} --
Bare fallow	0	0	41 c	2.1 b
Zea mais (non-fixing reference)	23	0	50 b	2.7b
Crotalaria juncea *(DWT green manure)*	27	43	77 a	3.8 a

Transition season crops

- **Cycle and save soil nitrate**
- **Add N from biological fixation (legumes)**
- **Inrease N uptake and yield of rice**
- **Contribute to sustainable management**



Effect of DWT management on ion exchange resin N_{min}

Transition season management of native nitrogen improves N nutrition and yield of rice in inland valleys of the dry savanna zone in West Africa

Michael Asante & Wilson Dogbe
CSIR- Savannah Agricultural Research Institute, Tamale-Ghana
Mathias Becker & Carlos Angulo
University of Bonn, Crop Science and Resource conservation, Bonn
Mathias Fosu
Association of Church-Based Development NGOs, Tamale, Ghana
Contact: mkasante08@yahoo.co.uk

We acknowledge the support of DAAD and *fiat panis* Foundation