



The role of nitrogen fixation in African smallholder agriculture



1. Introduction: biological N₂-fixation and the African smallholder

African smallholders face a conundrum! They spend their whole life surrounded by air which is 79% nitrogen gas and yet their crops are yellow and starved of nitrogen. The biological fixation of nitrogen by legumes offers a pathway for smallholders to access this infinite source of nitrogen. Yet current input of nitrogen fixation in African smallholder systems is very limited – often much less than 10 kg N ha⁻¹ when calculated across the whole farm.

Legumes are a key component of pathways to the Sustainable Intensification of agriculture: they provide food, fodder other products such as fuelwood and stakes and improve soil fertility (Vanlauwe et al., 2014). Further, legumes offer the opportunity to diversify monotonous diets, as protein and micronutrient dense food and to diversify cropping systems often built on monocultures of cereals or root and tuber crops. In Africa, rates of nitrogen fixation by grain legumes as high as 250 kg N ha⁻¹ have been measured in experimental fields, demonstrating their huge potential. Lastly, the sale of legume grains contributes substantially to household income in major legume production areas.

Against a backdrop of a rapidly growing population and decreasing farm size, a large pan-African collaborative project was initiated in 2009. The project entitled: *Putting nitrogen fixation to work for smallholder farmers in Africa: N2Africa* works across a wide range of agroecological conditions across 11 countries of sub-Saharan Africa. N2Africa is conceived as a “development-to-research” project in which grain legume technologies emerging from research are disseminated and tested at scale with many thousands of farmers (Giller et al., 2013). Through a structured and targeted approach N2Africa seeks to understand *where, when, why* and *for whom* approaches to the intensification and diversification of farming using different grain legume technologies work best. A key concept is the *socio-ecological niche* – recognizing the rich diversity of agroecologies, societies and cultures to enable the

matching of technologies to farming systems, farms and fields (Ojiem et al., 2006).

This Special Issue brings together a series of papers based on recent research on N₂-fixation by grain legumes and its wider benefits across sub-Saharan Africa. The final chapter (Vanlauwe et al., 2014) reflects on the contributions and highlights issues requiring the attention of research in future.

References

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