**Tropentag, September 18-21, 2016, Vienna, Austria**

"Solidarity in a competing world — fair use of resources"

# 'New Roots for Rice Production': Root Research in the Low-Input Systems of Sub-Saharan Africa

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**Abstract**

In large parts of sub-Saharan Africa (SSA), rice serves as an important staple crop. The rice consumption in SSA is steadily rising and population growth drastically increases the demand. As net rice importers, several countries in SSA face a critical socio-economic situation which endangers their food security. Rice production in SSA needs to increase, despite several biophysical limitations such as drought and low soil fertility. More specifically related to the latter, low soil phosphorus (P) availability is a key limitation. The uptake of water and P by roots is strongly related and different root traits or root characteristics have synergistic or antagonistic effects on water and P uptake.

High crop yields in 'high-input systems' are mostly sustained by intensive use of fertilisers and irrigation. However, conventional breeding strategies focusing on above ground features did neither lead to sustainable solutions nor to significant yield increases in low-input systems on which many resource-poor, smallholder farmers rely. In search for sustainable and resilient solutions to increase rice production in SSA, it is important to unravel the 'belowground opportunities' of the rice crop. The acquisition of soil resources by plant roots is of major importance to establish reasonable agricultural outputs in low-input systems. In this perspective, we need to understand the root responses of contrasting rice cultivars in situations that face combined drought and low P stresses.

In this study, both pot and field trials are established in Tanzania, whereby combined P and water treatments are imposed. During rice development, roots are excavated and washed out for root system and root morphology characterisation. The corresponding responses of roots and the genotypic variation among different cultivars will be evaluated and discussed.

The expected outcome is the selection of breeding traits that contribute to higher P- and/or water uptake-efficiency of rice. Using these traits, rice breeders could develop 'stronger' and 'more resilient' varieties that survive and reasonably produce in these constrained environments. This would have a substantial contribution to improving food security and root system research could hence contribute to a 'brown' revolution (from 'soil' and 'roots') in the resource poor agricultural systems of SSA.

**Keywords:** Drought stress, low phosphorus availability, rice, sustainable and efficient root systems

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