IDT1-001 | Economic analysis of alternative systems for sorghum production in Southern Mali

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This article aims to evaluate sorghum grain yields, cash income as well as risk-efficient choice associated with treatments of sorghum under the Africa RISING project in Mali. The analysis used the survey data related to on-farm trials covering the seasons 2014 and 2015. Four treatments have been experimented for sorghum including control treatment, treatment with only manure, treatment with mineral fertilizer, and treatment with manure and mineral fertilizer. Stochastic dominance analysis was used to evaluate the cumulative distributions of grain yields and cash income associated with each treatment. The results showed that the control treatment for sorghum is dominated by the manure and fertilizer treatments. The manure and mineral fertilizer treatment has higher yields and net returns compared to the three other treatments. The control treatment has a 50% chance of generating grain yields up to 850 kg/ha, while the manure treatment, mineral fertilizer treatment, and manure and mineral fertilizer treatment have the same probability of generating respectively 1,050 kg/ha, 1,275 kg/ha, and 1500 kg/ha. The net returns were estimated to US$ 122 for manure and mineral fertilizer treatment, US$ 87 for treatment with only mineral fertilizer, and US$ 84 for treatment with only manure. The cumulative distribution of manure and mineral fertilizer treatment was to the right of the remaining cropping treatments, indicating that manure and mineral fertilizer treatment provides higher returns to smallholder farmers than the alternative treatments for a given risk level. Risk-averse farmers will prefer treatment applying manure and mineral fertilizer if they can afford manure and chemical fertilization.

IDT1-002 | Mucilage secretion: Do plants protect their rhizosphere community from drought effects to maintain their beneficial functions?

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Mucilage secretion modulates soil-plant-water dynamics but also affects microbial communities' functioning. To assess the role of mucilage as C source for microorganisms and also its effect on biotic functions under drought, C4 mucilage was added in two levels to C3 soil under two different moisture contents (80 and 30% of WHC). Mucilage decomposition, microbial biomass and PLFA incorporation and hydrolytic enzyme activity was quantified.
After 15 days, most of the mucilage was decomposed (98% and 88%) under optimum water supply, but under drought only 77% and 30% of mucilage were decomposed for low and high mucilage amendment, respectively. However, microbial biomass incorporation of mucilage C was not affected under drought, suggesting its unhindered bioavailability. Gram Negatives and fungi were those groups incorporating most of the mucilage C into their PLFA. But fungi did not suffer from drought, and instead profited from the lower competitiveness of most bacterial groups. Under drought, mucilage addition always increased the maximum enzyme activity and frequently also affinity relative to the non-amended control and, thus, compensated for the loss in enzyme activity or affinity induced by drought.
This study suggests that mucilage has, besides its function as C source for microorganisms, a highly vital role as biofilm-like gel maintaining microbial and exoenzymatic activity even under drought conditions. Especially the reduced decomposition rate of mucilage under drought suggests that mucilage exudation is a plant trait that favors the capture of water and via the promotion of microbial life presumably also nutrients when water is scarce.