Abstract
Drivers of Phosphorus Efficiency in Tropical and Subtropical Cropping Systems †
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Phosphorus (P) is an essential nutrient but is commonly limiting for food production in tropical and subtropical maize cropping. The efficiency of P fertiliser uptake is often low (5–30%) for various site-specific reasons and so identifying the drivers of P efficiency for different systems is important. We conducted a sensitivity analysis on the parameters of a well-established cropping systems model (APSIM) for a wide range of soil, crop and management factors to understand their influence on yield. The analysis was conducted for two contrasting maize cropping systems: (a) a high-input, large-scale commercial system in subtropical Queensland, Australia and (b) a low-input, small-holder system in tropical, western Kenya. In Queensland, yield was most sensitive to available P and mineral N supply, and the sensitivity of both increased with in-crop rainfall. Available P was also the most important parameter in Western Kenya, but N supply had much weaker influence due to higher levels of organic matter. Parameters controlling P sorption were more important than other soil parameters at both sites irrespective of seasonal conditions. In conclusion, these results suggest that efforts to improve efficiency of P use by plants need to account for interactions between water and N supply in environments where these are limiting. They also highlight a potential constraint to modelling of these systems as some of the most influential parameters are difficult to measure directly.

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