



## Below-and above-ground pigeonpea productivity in a novel doubled-up legume cropping system across three agro-ecologies in Central Malawi

Chiwimbo Gwenambira<sup>1</sup>, Sieglinde Snapp<sup>1</sup>, Regis Chikowo<sup>1</sup>, Bekunda Mateete<sup>2</sup>

<sup>1</sup>Plant Soil and Microbial Sciences Department, Michigan State University, East Lansing, Michigan - USA

<sup>2</sup> International Institute of Tropical Agriculture (IITA), Arusha - Tanzania

### Abstract

Smallholder farmers in Malawi face many challenges which include a degrading soil resource base. Pigeonpea is one legume that has shown promise in Malawi in terms of improving soil fertility but its below and aboveground productivity is not fully understood. On-farm trials were set-up between 2013/16 across three agro-ecologies in central Malawi. Pigeonpea was planted as a sole crop or in an additive intercrop system with soyabean, groundnut or maize (farmer check system). The objectives of this study were to (1) assess the effect of cropping system and soil texture on pigeonpea root and shoot biomass and (2) to evaluate variability of pigeonpea growth within a smallholder farm context. For two cropping seasons, destructive harvests were conducted six months after planting to evaluate shoot parameters, and roots of the same plants were excavated from 0– 60 cm. Cropping system and soil texture influenced shoot and root biomass ( $\alpha=0.05$ ). Sole pigeonpea had the highest shoot biomass at 11.83 Mg/ha, root biomass at 1.56 Mg/ha and pigeonpea/maize had the lowest shoot biomass at 3.57 Mg/ha root biomass at 0.53 Mg/ha. Root biomass was largely confined to the 0-20 cm topsoil. The results confirm that intra-specific competition in a pigeonpea/maize intercrop is large, while pigeonpea productivity in pigeonpea/groundnut intercrop is comparable to sole cropped pigeonpea, with additional groundnut grain benefits. Promoting the later cropping system can enhance land productivity on the small farms that are often acutely constrained by their sheer small size as viable farming units.

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