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## Productivity and residual benefits of grain legumes to sorghum under semi arid conditions in south-western Zimbabwe

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### Abstract

The study was conducted for three seasons (2002/03, 2003/04 and 2004/05) in semi-arid southwestern Zimbabwe. The objective was to assess yield and residual benefits to sorghum (*Sorghum bicolor* (L.) Moench) grown after cowpea (*Vigna unguiculata*), Bambara groundnut (*Vigna subterranea*), groundnut (*Arachis hypogaea*) and pigeonpea (*Cajanus cajan*). Two varieties of each legume and a sorghum control were planted in a randomised complete block design, replicated three times. Soil moisture was measured weekly using a neutron probe (Wallingford type). Sorghum was planted after each legume phase, and moisture was also measured. Rainfall variability affected the grain yield of both the legumes and rotation sorghum. In 2002/03 (314 mm) cowpeas produced the largest grain yield (1.1 and 1.6 t ha<sup>-1</sup>,  $p < 0.05$ ) at 12.5% moisture content. In a wetter 2003/04 season (650 mm) groundnut varieties had the highest grain yield (0.9 and 1.2 t ha<sup>-1</sup>,  $p < 0.05$ ). In 2004/05 (301 mm) most legume yields were less than 0.5 t ha<sup>-1</sup> except pigeonpea ICPL 87091, which produced 0.7 t ha<sup>-1</sup> ( $p < 0.05$ ). Nitrogen fixed was 15–50% (2002/03), 16–61% (2003/04) and 29–83% (2004/05). Water use by the legumes was related to the legume type and growth duration. Sorghum grain yield in 2003/04 reached 2.2 t ha<sup>-1</sup> ( $p < 0.05$ ), almost three times the national average. In 2004/05, the sorghum yields were also high (1 — 1.8 t ha<sup>-1</sup>), but not significant ( $p = 0.057$ ) when the previous legumes were compared. The incorporation of residues had no significant effect on sorghum yield in both seasons. The results showed that there is potential for increasing grain legume cultivation in semi-arid environments. Modelling these results will provide more information on the longer term productivity and sustainability of the rotations.

**Keywords:** Bambara groundnut, cowpea, granitic sands, groundnut, pigeonpea, soil water