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## Evaluating the Sustainability of Maize-legume Strip Cropping Technology in the Context of Smallholder Farmers in Northern Ghana

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### Abstract

Agricultural intensification, producing more output per unit area of land through efficient use of resources has increased food production by smallholder farmers in West Africa including Ghana. Many agricultural technologies have been promoted to intensify the smallholder farming in Ghana, but there is a dearth of evidence on the sustainability of these technologies. A 3-year (2014–2016) on-farm study was conducted to evaluate the sustainability of maize-legume strip cropping technology in northern Ghana. The strip cropping technology involved the intercropping of maize with two widely grown legumes (cowpea and groundnut) in northern Ghana. Four strip cropping options: two rows of maize and two rows of cowpea or groundnut (2M:C and 2M:2G) and two rows of maize and four rows of cowpea or groundnut (2M:4C and 2M:4G) and sole cropping of each crop were laid-out in a randomised complete block design with five replications. We used Sustainable Intensification Assessment Framework (SIAF) to assess the sustainability of the above treatments. The SIAF measures the sustainability of agricultural technology based on five domains: productivity, economic, environment, human and social domains. We conducted the assessment in three steps: 1) Measured selected indicators from the five SIAF domains which were useful to answering research question, 2) Converted the actual values of the indicators into scores using the Min-Max scaling (scores lie within 0–1 range) and 3) Aggregated the scores of the indicators under each of the domain and Calculated sustainability index using geometric rules considering each SIAF domain as an edge of a pentagon. Specific indicators used in this study were: grain yield and land equivalent ratio (productivity), net income and variability of net income (economic), biological nitrogen fixation and intercepted photoactive radiation (environment), calorie and protein production (human) and technology rating by gender (social). The results showed that the 2M:2G strip cropping option recorded sustainability index of greater than one, indicating better sustainability than the other treatments. This suggests that 2M:2G strip cropping option can enhance the sustainability of smallholder farming systems in northern Ghana and similar agro-ecologies in West Africa and better their wellbeing through its effects on income, nutrition, and gender equity.

**Keywords:** Cowpea, groundnut, maize, northern Ghana, SIAF, sustainability