Benefits of Peanut – Cereal Rotation and Inputs Systems on Maize Growth and Yield in Northern Part of Ghana

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One important benefit of including legumes in crop rotations is their ability to make nitrogen available to the next crop through biological nitrogen fixation. However, this soil benefit becomes unavailable, because most farmers in Northern Ghana collect peanut haulm as animal feed after each season. To demonstrate the benefit of leaving peanut haulm to the next crop, two separate 2 × 2 × 3 factorial experiments were conducted in 2020 at Tamale and Wa in the Northern and Upper West Regions of Ghana respectively, following crop rotations initiated in 2019. Peanut or maize was planted in 2019 depending on the rotation system and the integrity of the plots were maintained for follow up cropping of maize in the 2020 season. The experiments comprised two levels of crop rotation (peanut–maize versus maize–maize), two levels of maize varieties (hybrid 'CRI Ahof3' versus the open pollen variety (OPV) 'CRI Omankwa'), and three levels of production and pest management inputs [low input (LI) that included high quality seed, timely planting, and 1 manual weeding; moderate input (MI) that included high quality seed, timely planting, 2 manual weedings, 1 time insecticide treatment, and urea fertilizer applied 5–6 weeks after planting (WAP) for maize; or high input (HI) that included high quality seed, timely planting, preemergence application of pendimethalin followed by 1 manual weeding, 2 applications of insecticide, NPK (15:15:15) applied 2 WAP followed by urea application at 6 WAP for maize]. A wide range of data were recorded associated with pest and crop response. Cost for all inputs was recorded to enable benefit:cost analysis. Data were analyzed using Statistix 9 data software; ANOVA was generated and means separated by SED at 5%. In both locations, the interaction between peanut–maize rotation and all input systems produced taller maize plants at 3 WAP than the maize–maize rotation and input systems when data were pooled over varieties. In addition, the application of HI, MI, or LI on peanut–maize rotation resulted in significantly taller maize plants at 12 WAP than their corresponding input systems on the maize–maize rotation in both locations when data were pooled over varieties. When data were pooled over varieties and production systems, the peanut–maize rotation produced greater yield (1.4 metric tons/ha at Tamale and 2.5 metric tons/ha at Wa) than the maize–maize rotation (0.9 metric tons/ha at Tamale and 2.0 metric tons/ha at Wa). Grain yield of hybrid maize was greater in the peanut–maize rotation (1.6 metric tons /ha at Tamale and 3.2 metric tons/ha at Wa) than the maize–maize rotation (0.9 metric tons/ha at Tamale and 2.5 metric tons/ha at Wa) when data were pooled over production input systems. In Tamale, hybrid maize yielded more grain in the HI system (3.0 metric tons/ha) or the MI system (1.8 metric tons/ha) in the peanut–maize rotation than their corresponding input systems on the maize–maize rotation (2.0 or 0.6 metric tons/ha) or the first year (2019) maize (2.6 or 0.8 metric tons/ha). In addition, the HI system in peanut–maize rotation for the OPV also significantly produced much grain yield (2.4 metric tons/ha) than the same system for the first year maize (1.8 metric tons/ha) or maize–maize rotation (1.5 metric tons/ha). At Wa, the HI system increased hybrid grain yield when applied in the peanut–maize rotation (4.7 metric tons/ha) or maize-maize rotation (4.4 metric tons/ha) than the HI system of the first year maize (2.6 metric tons/ha). The application of MI in the peanut–maize rotation (4.3 metric tons/ha) also increased hybrid maize grain yield more than the MI system for the maize–maize rotation (2.9 metric tons/ha) or the first year of maize (1.6 metric tons/ha). Peanut will be established following both of these rotations in 2021 in both locations