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**Spatially explicit modeling of sorghum (*Sorghum bicolor* (L.) Moench) production on complex terrain of a semi-arid region in Ghana using APSIM**

Sorghum production in response to inorganic fertilizer application was simulated for two distinct smallholder systems in a semi-arid environment in Ghana. Grain yield was predicted with an internal coefficient of efficiency of 0.64. Increase in grain yield in response to inorganic fertilizer varied spatially due to variation in soil fertility. Incorporation of crop residues and inorganic fertilizer application positively influenced grain yield over the years, with a corresponding positive influence on soil organic matter. Crop residues also reduced yield variability. The use of inorganic fertilizer and crop residues (organic matter) is thus critical to sustaining food production in this area.