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Decomposition and nutrient release patterns of leafy biomass-derived sheep manure from tree/shrub species in the Sudano-Sahelian zone of Burkina Faso, West Africa

Siriki Fané[1], Deogratias Kofi Agbotui[1], Linda C. Gabriella Traore[2], Mariko Ingold[1], H. Oumou Sanon[2], Eva Schlecht[3], Andreas Buerkert[1]

[1] *University of Kassel, Organic Plant Production and Agroecosyst. Res. in the Tropics and Subtropics, Germany*

[2] *Institute de l'Environnement et de Recherche Agricoles du (INERA), Département de Production Animales,*

[3] *University of Kassel / University of Goettingen, Animal Husbandry in the Tropics and Subtropics, Germany*

Abstract

In West Africa's Sahelian open-parkland regions, farmers frequently utilise animal manure as an organic amendment to improve soil fertility and sustain crop production. This study aims at monitoring decomposition and nutrient release patterns of leafy biomass-derived sheep manure fed to selected tree/shrub species from the region at 30 % of their diet. To this end, field research was conducted in the West-Central region of Burkina Faso, using sheep manure derivatives from *Bombax costatum* Pellegr. & Vuill., *Ficus sycomorus* L., *Khaya senegalensis* (Desr.), and from bush straw, applying the litterbag technique. Each litterbag was filled with 17 g of manure and sampled at 2, 4, 8, 16, and 32 weeks after placement in the soil at 15 cm depth using a completely randomised block design. During the first four weeks after placement, decomposing leaf-derived manure lost on average 48 % of its initial dry mass (DM). At weeks 2 and 4, DM losses from bush straw-derived manure were 97 % and 46 %, respectively, larger ($p < 0.05$) than from *B. costatum, F. sycomorus*, and *K. senegalensis*. Similarly, average nitrogen (N) release from bush straw-derived manure at 2, 4, 8, and 16 weeks after placement was 90 % ($p = 0.03$), 79 % ($p < 0.01$), 99 % ($p = 0.04$), and 9 % ($p = 0.04$), respectively, higher than from the leaf-derived manure. At 4 and 8 weeks after placement, average phosphorus (P) released by manure from *B. costatum* and *F. sycomorus* was 47 % ($p < 0.01$) and 50 % ($p = 0.03$), respectively, lower than from straw and *K. senegalensis*. Potassium (K) released by manure from straw and *K. senegalensis* was 1.7-fold ($p < 0.01$) and 1.4-fold ($p = 0.01$), respectively, higher than from *B. costatum* and *F. sycomorus*. The quick nutrient release of straw- and *K. senegalensis*-based manure is beneficial for fast crop growth provided that leaching is limited, while manure derived from *B. costatum* and *F. sycomorus* may be better suited to improve longer-term soil fertility.

Keywords: Agroforestry systems, crop nutrition, fertiliser alternatives, nutrient cycling, soil fertility, sustainable agriculture

Contact Address: Siriki Fané, University of Kassel, Organic Plant Production and Agroecosyst. Res. in the Tropics and Subtropics, Steinstr. 19, D-37213 Witzenhausen, Germany, e-mail: siriki.fane@mesrs.ml