Laboratory validation of a conceptual framework for organic resource management based on organic resource quality

Vanlauwe B, Gachengo C, Shepherd KD, Barrios E, Cadisch G, Palm CA 2005. Soil Science Society of America Journal 69: 1135–1145. *

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Abstract

Organic resources (ORs) are essential inputs in tropical farming systems and their decomposition dynamics are related to their quality. A Decision Support System (DSS) for organic N management has been proposed earlier that subdivides ORs in 4 classes depending on their N, lignin, and soluble polyphenol contents. To validate this DSS, a 28-day aerobic incubation experiment was initiated with 32 ORs, mostly crop and tree residues, applied to a sandy loam soil. The ORs contained 1.4 to 53.2 g kg^{-1} N, 25 to 295 g kg^{-1} lignin, and 4 to 148 g kg^{-1} soluble polyphenols. In-vitro dry matter digestibility ranged from 70 to 820 g kg^{-1}. After 28 days, CO_2-C production varied between 199 and 905 mg CO_2-C kg-1 soil, and mineral N contents ranged from 5 to 109 mg N kg^{-1} soil. Based on N mineralization data, 3 classes of ORs were evident: class A with N release > 0, class B with N release ≈ 0, and class C with N release < 0 (N immobilization). Criteria to separate those classes were based on the OR N and polyphenol content and cut-off values between the classes agreed well with those proposed in the original DSS. For class A ORs, N mineralization was negatively related to their lignin/N ratio (except for *Gliricidia* residues) and for class C ORs, N immobilization was positively related to their N content. Short-term mineralization data supported the existence of 3 classes of ORs instead of 4 originally proposed by the DSS. However, ORs also govern other functions, operating in the medium to long term, and for these functions, the original 4-class concept may be proven valid.

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