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Biomass Production, Nutrient Uptake and Partitioning in Planted *Senna spectabilis*, *Flemingia macrophylla* and *Dactyladenia barteri* Fallow Systems Over Three Fallow/Cropping Cycles on Ultisol

STEFAN HAUSER

International Institute of Tropical Agriculture, Humid Forest Eco-regional Center, Cameroon

Abstract

Six years after establishment and after 5 consecutive maize / cassava intercrops, an alley cropping (hedgerow intercropping) experiment on Ultisol in southern Cameroon was converted to a two-year fallow, one-year groundnut/maize/cassava intercropping system. Biomass production and nutrient uptake of all components in planted *Senna spectabilis*, *Dactyladenia barteri* and *Flemingia macrophylla* hedgerow fallow were determined after three two-year fallow phases and compared to natural fallow.

Total above-ground biomass dry matter production by the end of each of the three fallow phases was significantly higher in the *S. spectabilis* system than any other system, due to the significantly higher biomass production of the *S. spectabilis*. Total above ground biomass production in the *F. macrophylla* and the *D. barteri* systems was not different from that in natural fallow. The volunteer biomass between hedgerows was only once significantly reduced by *S. spectabilis* during the first fallow phase. The amount of litter did not differ between fallow systems. The biomass of *S. spectabilis*, *F. macrophylla* and *D. barteri* comprised 96, 95 and 65 % wood, respectively. Relative to the total biomass, wood constituted 67 % in *S. spectabilis* and about 20 % in *F. macrophylla* and *D. barteri* systems.

Except for Mg, the *S. spectabilis* system accumulated more nutrients in above ground biomass than any other system. The highest nutrient uptake achieved in the *S. spectabilis* system was 335 kg ha⁻¹ N, 331 kg ha⁻¹ Ca, 230 kg ha⁻¹ K, and 39 kg ha⁻¹ P. Relative to the *S. spectabilis* system, nutrient accumulation, except for Mg, was the lowest in the natural fallow control followed by the *F. macrophylla* and the *D. barteri* system. In *F. macrophylla* and *S. spectabilis*, 95 % and 85 % of the nutrients were accumulated in the wood. In *D. barteri* the nutrient distribution between leaves and wood was approximately equal. Export of the hedgerow wood would remove between 9 and 16 % of the nutrients accumulated in the *F. macrophylla* and *D. barteri* systems but between 27 and 53 % in the *S. spectabilis* system.

Keywords: *Dactyladenia barteri*, fallow, *Flemingia macrophylla*, nutrient accumulation, planted fallow, *Senna spectabilis*, Ultisol, wood export