

Litter and biomass production from planted and natural fallows on a degraded soil in southwestern Nigeria

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Abstract

To rehabilitate a degraded Alfisol at Ibadan, southwestern Nigeria, *Senna siamea* (non-N-fixing legume tree), *Leucaena leucocephala*, and *Acacia leptocarpa* (N-fixing legume trees) were planted in 1989, and *Acacia auriculiformis* (N-fixing legume tree) in 1990. *Pueraria phaseoloides* (a cover crop) and natural fallow were included as treatments. Litterfall and climatic variables were measured in 1992/1993 and 1996/1997 while biomass production and nutrient concentrations were measured in 1993 and 1995. Total litter production from the natural and planted fallows was similar, with means ranging from 10.0 (*L. leucocephala*) to 13.6 t ha⁻¹ y⁻¹ (natural fallow) during the 1996/1997 collection. Leaves constituted 73% (*L. leucocephala*) to 96% (*A. auriculiformis*) of total litterfall. *Acacia auriculiformis* grew most quickly but *S. siamea* produced the highest aboveground biomass which was 127 t ha⁻¹ accumulated over four years, and 156 t ha⁻¹ accumulated over six years of establishment. The aboveground biomass of *P. phaseoloides* and natural fallow was only 6 to 9 t ha⁻¹ at six years after planting. Nitrogen concentration in the leaves/twigs of was 2.5% for *L. leucocephala*, and 2% for other planted species and natural fallow. *Pueraria phaseoloides* had concentrations of P, K, Ca and Mg comparable to levels in the leaves/twigs of the tree species. Through PATH analysis, it was found that maximum temperature and minimum relative humidity had pronounced direct and indirect effects on litterfall. The effects of these climatic variables in triggering litterfall were enhanced by other variables, such as evaporation, wind, radiation, and minimum temperature. Improvement in chemical properties by fallows was observed in the degraded soil.

leguminous trees - litterfall - planted and natural fallows - southwestern Nigeria