ABSTRACT

The deliberate planting of fast-growing N_2–fixing legume monoculture species in rotation with cereal crops can be an important source of N for soil fertility replenishment. We hypothesized that mixed-species fallows have a higher potential of giving long-term residual benefits in terms of biomass, nutrients, and quality of residuals leading to long-term nutrient supply to postfallow maize (*Zea mays* L.) crops. To test these hypotheses, two experiments were established in farmers' fields on very fine Kandiudalfic Eutrudox soils with monoculture and mixed-species fallows. Treatments included: sesbania [*Sesbania sesban* (L.) Merr.], crotalaria (*Crotalaria grahamiana* Wight and Arn.), pigeonpea [*Cajanus cajan* (L.) Millsp.], siratro [*Macroptilium atropurpureum* (DC.) Urb.], and calliandra (*Calliandra calothyrsus* Meissn.) as monoculture-species fallow and mixture fallows of sesbania + crotalaria, sesbania + pigeonpea, sesbania + siratro, or sesbania + calliandra compared with continuous maize cropping with or without N fertilizer, and natural weed fallow. Total aboveground biomass ranged from 4.1 to 20.5 Mg ha^{-1} for monoculture and 7.8 to 23.3 Mg ha^{-1} for mixed-species fallows. Recyclable fallow biomass N ranged from 70 to 313 kg ha^{-1} and there was a positive interaction in some mixtures leading to increased N accumulation. Postfallow maize yields for fallows over five cropping seasons were 161–272% or 61–103% higher when compared with continuous maize without or with N fertilizer, respectively. Long-term postfallow effects on maize yield were linearly related to the amount of recycled fallow N yield. Thus, choice of fallow species to mix should be primarily driven by a better risk management strategy and an increased basket of multiple products and services.