

Land productivity in the central highlands of Kenya is mainly constrained by low and declining soil fertility. In the maize-based farming systems, continuous cultivation without adequate soil fertility enhancement measures has led to a deterioration of land quality resulting in low agricultural yields and degraded soils. Herbaceous legumes can provide an alternative to commercial fertilizers and animal manures. This study explored the use of these legumes in Embu District - situated within the central highlands of Kenya. In order to achieve this objective a survey and four field experiments were conducted to: (1) Validate farmers' knowledge and practices in soil fertility and use of plant residues; (2) Determine the performance of maize and green manure herbaceous legumes under different intercropping densities and relay-cropping regimes; (3) Investigate the relative efficiency of different legume residue management techniques and determine the need for mineral nitrogen (N) supplementation and (4) Determine the role of low quality plant residues as agents for slowing down the fast-decomposing legume residues to improve N synchrony for maize growth. The study consisted of one survey and four on-station field experiments. The survey involved a total of 134 small-scale farmers cutting across 5 major agro-ecological zones of the 30 km transect of the district. About 87 per cent of all the farmers in the district were affected by the problems of low soil fertility in their farms. Farmers gave soil colour and structure as some of the visual soil fertility assessment indicators used to determine soil fertility status in their farms but the most pronounced and elaborate local indicators seemed to be the dominance of certain weed flora. Soil pH and exchangeable bases (Ca^{++} and Mg^{++}) were the most sensitive laboratory soil parameters that corroborated farmers' perceptions and knowledge of soil fertility. Results of the field experiments showed that it is feasible to intercrop maize with any of the three green manure legume species, namely, mucuna [*Mucuna pruriens* (L.) DC. Var. utilis (Wright) Bruck], crotalaria [*Crotalaria ochroleuca* G. Don] and lablab [*Lablab purpureus* (L) Sweet cv. Rongai]. Relay-cropping these green manure legumes (GML) beyond the second week after maize emergence had a significant reduction on legume biomass production possibly due to reduced photosynthetically active radiation (PAR) under the maize canopy. Intercropped GML intercepted less than 30 per cent of the total incident radiation. Nonetheless, intercropping of maize and GML greatly improved land productivity giving relative yield total (RYT) values of between 1.0 and 1.5. Incorporation or surface mulching of the GML residues gave similar maize yield responses that was about double that of the control (no residues). Supplementation of the GML residues (raised *in situ*) with mineral N was only beneficial if the quantities incorporated were below 2.0 Mg ha⁻¹. Maize grain yield after mucuna, crotalaria and lablab residues alone (no mineral N supplemented) was 2.5, 2.3 and 1.6 times higher, respectively, than those of the control. Soil N mineralization reached a peak 4 weeks after planting (WAP) and declined thereafter until 8 WAP before picking up again for the remainder of the season. Seasonal mineral N levels ranged between 40 to 128 kg N ha⁻¹. GML residue treated plots gave significantly higher total N uptake than the untreated plots. Over the 3 year period, legume residue incorporation resulted in a slight reduction (0.9-1.8%) in soil bulk density, a small increase in the soil total N but no change in the soil pH. Addition of low quality residues (maize stover) to any of the three GML residues did not affect N release but appeared to enhance their performance. Soil mineralization and maize N uptake was not affected by the addition of low quality residues to the GML residues but resulted in a small increase in the total soil N and pH. However, addition of large quantities of these low quality residues (6.0 Mg ha⁻¹) significantly increased the soil organic carbon by 13 per cent and also decreased the soil bulk density by 8.3 per cent when compared to the absolute control with no residues added.