

Soil Mineral N Dynamics in a Maize Crop Following Different Soil Fertility Amendments in Different Soil Fertility Status in Sub-humid and Semi-arid Regions in Central Kenya

Monica Mucheru-Muna, Daniel Mugendi, Jayne Mugwe, James Kung'u, Roel Merckz, Bernard Vanlauwe

Journal of Agricultural Biological and Environmental Statistics (impact factor: 1.21). 01/2009; 5(6):978-993.

ABSTRACT

: Nitrogen is the major limiting nutrient in crop production and it is also one of the nutrients that is easily lost from the plant-soil system in various ways. Due to this, N supply, N management and N-use efficiency will continue to be important factors in crop production and at the same time a reminder of the concern as to the availability of fossil fuel reserves for future fertilizer N production. Determination of the synchrony of the N applied and its uptake following application of tithonia, calliandra, lantana, mucuna, manure and fertilizer amendments was carried out during the 2005 long and short rains season in two existing experiments that had been established during the 2004 short rains. The experiments were in two distinct agro-ecological areas (Mucwa – sub humid & Machang'a – semi arid) in the central highlands of Kenya. The relatively high levels of mineral N (over 30 kg N ha⁻¹) were recorded at the beginning of the seasons in the three sites posing a challenge because the high amounts of mineral N are not utilized by the crops as at this time when the rooting system is not adequately established.

The bulk of mineral-N found in the soil in all the treatments and sampling periods in both seasons in the three sites was in the form of nitrate-N. This could be as a result of the rapid conversion of ammonia to nitrate following mineralization of inputs in the soil. In Machang'a the amount of ammonium-N was relatively high compared to Meru South due to the drier condition of the soils in that site. The amount of ammonium-N and nitrate-N fluctuated across the seasons, for instance in Machang'a during the LR 05 season, the percentage of the ammonium-N was relatively high during the 0 WAP (47%), however it declined at 4 WAP (14%), and then at 8 WAP (13%), then increased at 8 WAP (28%) and remained the same until the end of the season. There was a very weak correlation between maize grain yields and mineral N at all sampling times in the three sites. In seasons when rainfall was well distributed, the N uptake was relatively high with most of the mineral N being taken up during 0-12 weeks after planting (WAP).