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Using organic matter to increase soil fertility in Burundi: potentials and limitations

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Agriculture production in Burundi is dominated by small scale farmers (0.5 ha/household) who have only very limited access to mineral inputs. In the past, farmers have relied on fallow practices combined with farm yard manures to maintain and improve soil fertility. However, due to the high population growth and high population density (370/km^2), fallow practices are nowadays no longer feasible, animal manures cannot be produced in sufficient quantities to maintain soil productivity and food insecurity has become a quasi permanent reality. Most Burundian soils are characterized by 1:1 types of clay minerals (kaolinite) and are acidic in nature. Such soils are of very low cation exchange capacity (CEC). To compare the effect of % clays and % organic matter (% C), correlations tests have been conducted between the two parameters and the CEC. It was found that in high altitude kaolinitic and acidic soils, CEC was highly correlated to % C and less correlated to % clay, suggesting that organic matter could play an important role in improving fertility and productivity of these soils. Based on these findings, additional studies have been conducted to evaluate the fertilizer and soil amendment values of animal manures (cattle, goat, chicken), and leguminous (Calliandra calothyrsus, Gliricidia sepium, Senna simea, Senna spectabilis) and non-leguminous (Tithonia diversifolia) foliar biomass. It was observed that chicken manure significantly reduces Al3+ levels in acidic soils, while Tithonia diversifolia outperforms in nutrient releases compared to the commonly known leguminous agroforestry shrubs and trees indicated above. Although the above mentioned organic sources can contribute to the soil nutrients supply, the quantities potentially available on farm are generally small. The only solution is to supplement these organic sources with other organic sources (compost, organic household waste), chemical fertilizers and mineral amendments (lime) to achieve Integrated Soil Fertility Management. The amendments with inorganic minerals must be on the one hand as specific as possible to function as a real site-specific fertilizer, on the other hand it should be a generic blend to make it less expensive. This is a dilemma, and requires new ways of balancing organic matter and nutrients in the soils.
Key words: Kaolinitic and acidic soils, CEC, Organic matter, animal manures, foliar biomass.