Tropentag, September 15-17, 2021, hybrid conference

"Towards shifting paradigms in agriculture
for a healthy and sustainable future"

Biomass Contribution and Nutrient Balances under Different Organic Matter Management Practices on Smallholder Farming Systems

Deous Mary Ekyaligonza[1], Thaddeo Kahigwa Tibasiima[2], Bendicto Akoraebirungi[3], Bernhard Freyer[4]

[1] *University of Natural Resources and Life Sciences, Vienna (BOKU), Division of Organic Farming, Austria*

[2] *University of Natural Resources and Life Sciences, Vienna (BOKU), Division of Organic Farming,*

[3] *Mountains of the Moon University, Dept. of Agriculture, Uganda*

[4] *University of Natural Resources and Life Sciences, Vienna (BOKU), Div. of Organic Farming, Austria*

Abstract

This study aimed at modifying the cropping systems through the application of comprehensive OMM practices to improve biomass and nutrient balances in annual farming systems including a combination of leguminous forage cover crops, alley crops, crop residues (stalk and leaves) and farmyard manure (FYM) into a rotation to improve soil fertility, nutrient balances and biomass development. A 2-year field experiment was set up in the Rwenzori region of Uganda following a randomised complete block design with five treatments replicated on ten smallholder farms. The treatments include T1: maize monocrop with DAP application at a rate of 50 kg ha^{-1} (9N - 10.12P kg ha^{-1}); T2: grain legume-maize rotation; T3: grain legume-maize/*Mucuna pruriens* rotation + FYM at a rate of 2.5 t ha^{-1} (13N - 6P – 18K kg ha^{-1}); T4: Faidherbia albida alleys with incorporation of leaves + grain legume-maize/*M. pruriens* rotation; and T5: F. albida alleys with incorporation of leaves + grain legume-maize/*M. pruriens* rotation + FYM. T2, T3, T4 and T5 are referred to as the OMM practices. For each treatment, the crop residues from the previous season were incorporated within the field. The results show that soil pH, water holding capacity, nitrogen, phosphorus and potassium levels increased as seasons progressed but were not significantly different between treatments. The recyclable biomass (dry weight of crop residues, F. albida leaves and *M. pruriens*) was significantly higher under T4 and T5. The highest recyclable biomass was observed in the fourth season under T4 and the amounts were 89.9 %, 89.3 %, 87.2 % and 41.9 % higher than T1, T2, T3 and T5 respectively. All treatments resulted into negative nutrient balances during the first three seasons. The negative nitrogen and potassium balances were more under F. albida treatments than in other treatments. This was due to the young age of the trees as the seedlings can only transfer less nutrients from the sub soil than the mature trees. In the fourth season, all the OMM practices resulted into positive N, P and K balances indicating that the OMM practices can cover the nutrient demand better than the non-organic treatment.

Keywords: , alley cropping, Biomass, Faidherbia albida, Farmyard manure, Nutrient balance, Organic matter management, Smallholder farm

Contact Address: Deous Mary Ekyaligonza, University of Natural Resources and Life Sciences, Vienna (BOKU), Division of Organic Farming, Gregor-Mendel-Straße 33, 1180 Vienna, Austria, e-mail: mary.ekyaligonza@students.boku.ac.at